The

BREMER and TULLY

"COUNTERPHASE"

A Vintage Radio MONOGRAPH

by

D. H. MOORE

INCOMPLETE - Some Pages Missing

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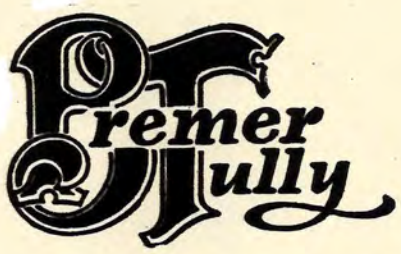


Harry A. Bremer set-up shop on Canal Street, Chicago, in 1916 selling electrical hardware and telephone accessories. His entry into the radio market on a practical scale did not occur until after 1922, when he began contributing one-tube tuner circuits to the mushrooming Radio media. There is no record that Bremer ever produced units under his own name, just circuit designs.

His first original contributions were the design and manufacture of a tuning coil and a more famous 3-circuit tuner coil assembly which you will find detailed herein. When John C. Tully joined him to eventually become president and treasurer (1924), BREMER-TULLY was in business, designing and manufacturing tuning coils, variables, RFC's, neutralising condensers, A and B-eliminators, accessories, as well as the production of kits containing their own parts for their circuits.

The advent of the B-T "Torostyle" toroidal coil with a square cross-sexion was designed in 1924 - the year in which toroidal coils were in vogue - and it proved to be superior to all others, and was a feature of all subsequent B-T sets, until the latter-day series known as the "Counterphase Eight" and "Counterphase Six", which you will also find detailed herein. The first "Counterphase Six" of 1924 - which began life known as the "B-T FOUR" - proved an instant success in an elabourate kit package.

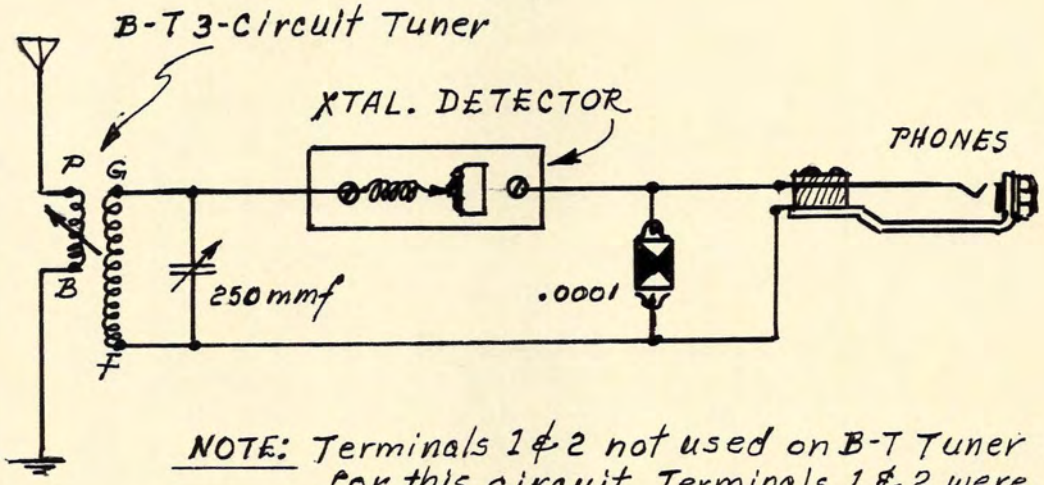
The latter-day "Counterphases" were never sold in kit form, a wise move at the time, as all genuinely efficient circuitry could no longer be built by the average home-constructor, due chiefly to price of the necessary components, more than anything else.

BREMER-TULLY sold out to the Brunswick-Balke interests in '29 and Bremer seems to have left the scene. Tully continued to produce a few designs for small SW tuners into the early Thirties, a couple of which will be found at the end of this Monograph.

Details of all B-T circuitry and sets will be found following on, and were and are well-worth your interest, restoration, labour.

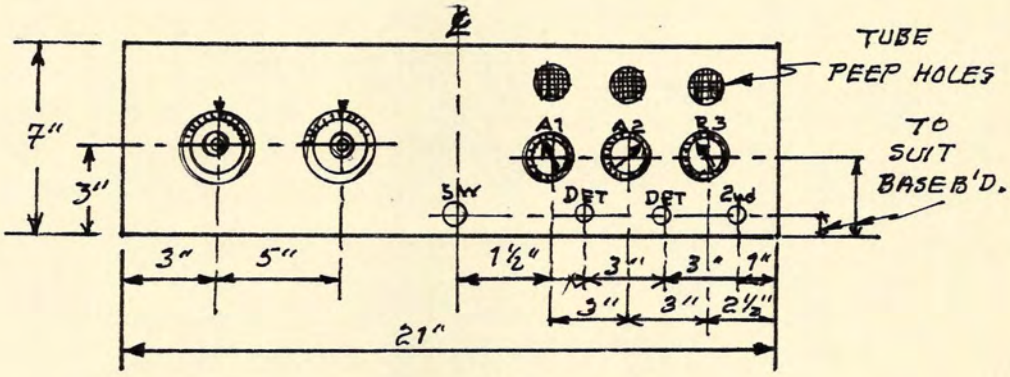
* * *

B-T CRYSTAL DETECTOR CIRCUIT, 1922



NOTE: Terminals 1 & 2 not used on B-T Tuner for this circuit. Terminals 1 & 2 were normally the Rotor.

B-T PANEL DESIGN FOR CIRCUITS Nos. 1 & 2



BREMER-TULLY SW RECEIVER, 1922: Sht. 2

Circuit was designed for V99 tubes. X99 or 01A tubes may be substituted, simply by replacing the 4-ohm and 2-ohm filament resistors with 1-A Amperites, and re-wiring "F" or "G" socket contacts to suit. Either series 99 tube will burn at 3V maximum (2.9V being preferred); the 01A tubes should be burned at 4.9V for greatest efficiency.

ORIGINAL GENERAL PARTS LIST

B-T L-7 (125mmf Variable)	$4.25
B-T L-13 (250mmf Variable)	4.50
B-T RFC	.90
B-T AF Xfrmr. 2.2:1 (2)	12.00
B-T DeLuxe Dials (2)	7.00
.00025MF Grid condenser	.40
FIL Control Jack (Carter 102-A)	
Output Jack (Carter 103)	
Grid-Leak 2 to 5 Megohms	
Eby Binding Posts (5)	
#14 Buss-bar, 15'	

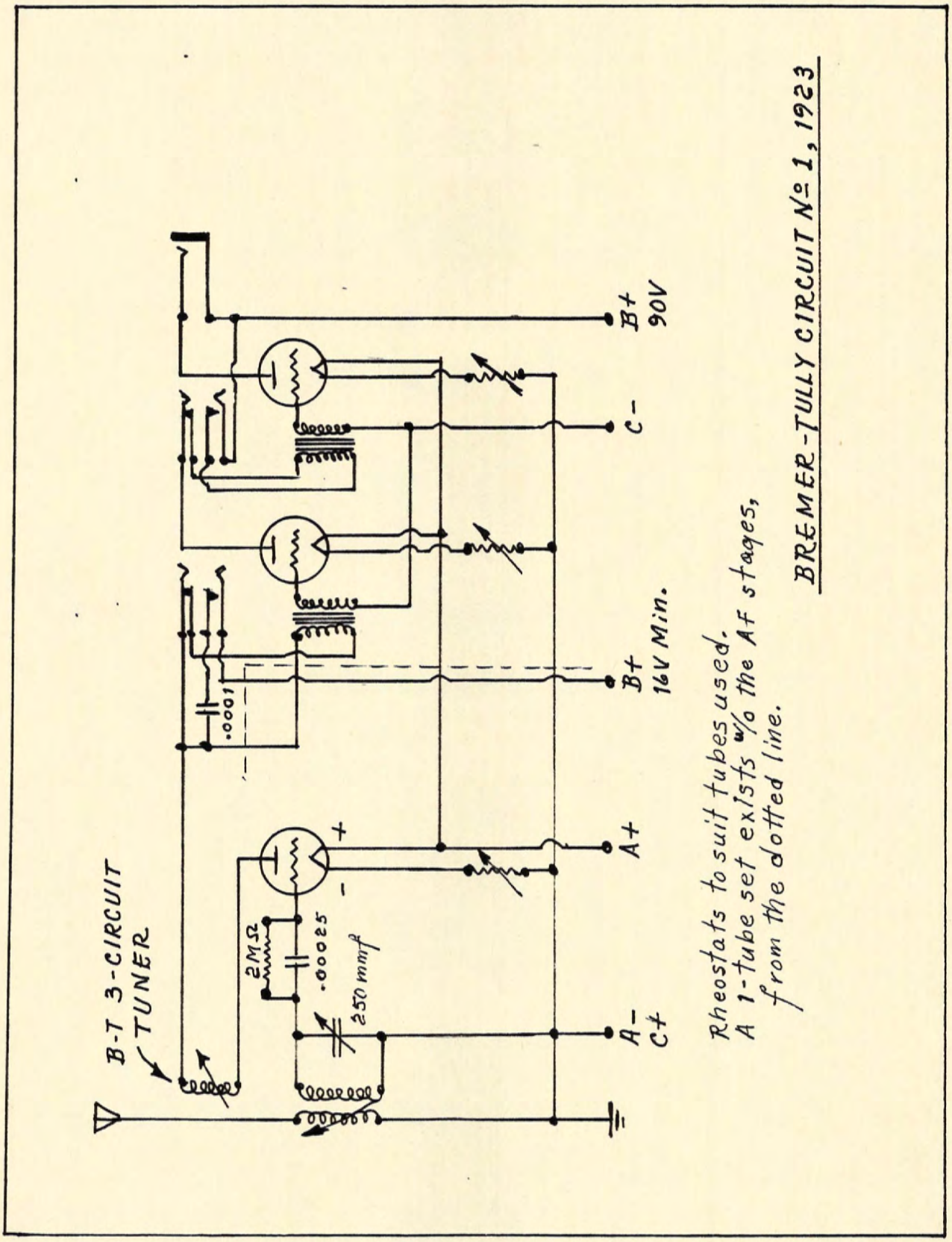
Panel = 7" x 14" x 3/16"

Comparable parts may be substituted, naturally, except, of course, the special Bremer-Tully SW plug-in coil set, that plugged-in on an horizontal base, also supplied.

B-T COIL RANGES

15 - 25	Meters
25 - 50	"
50 - 100	"
100-200	"
190-370	"
370-550	Meters

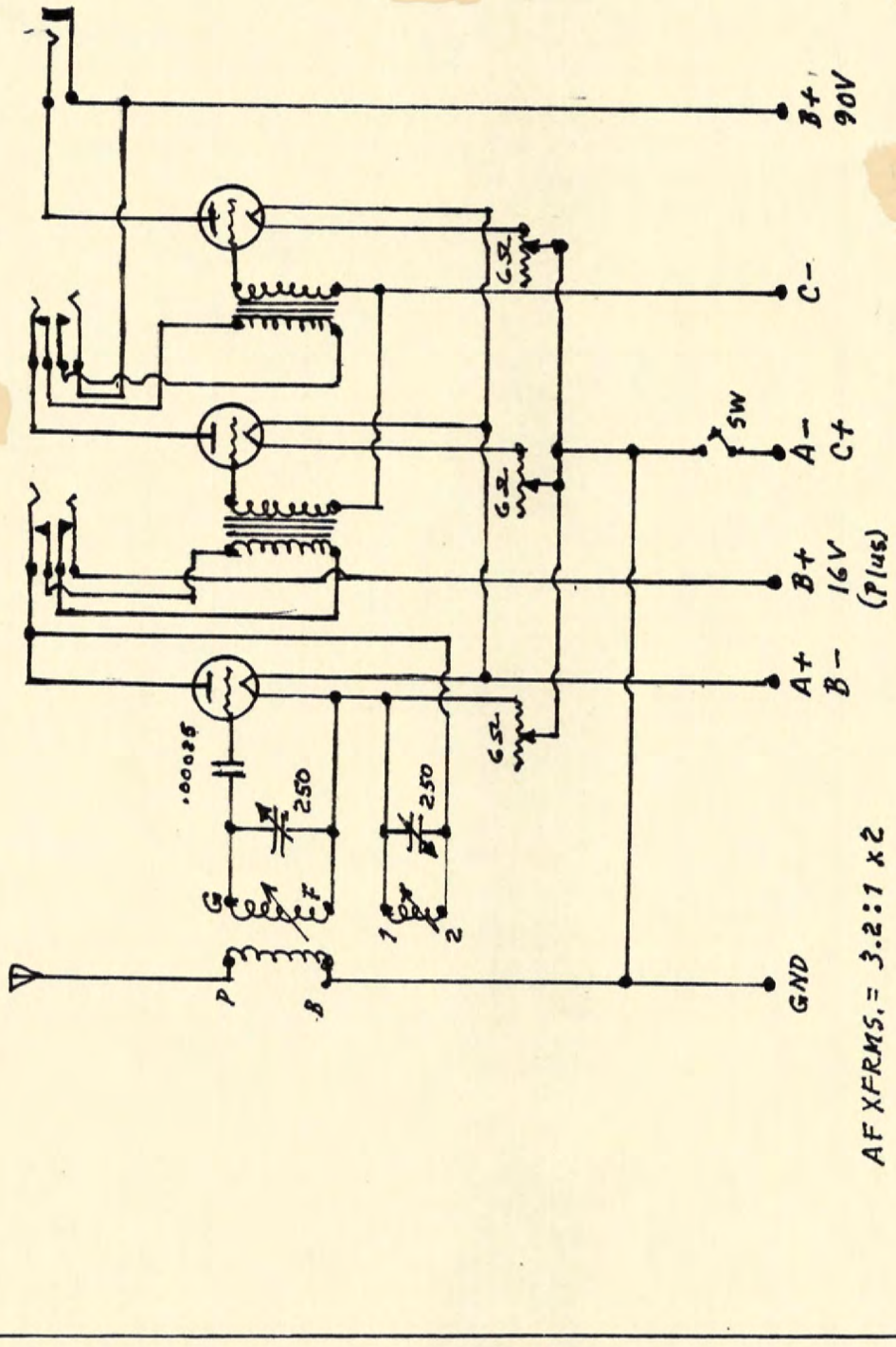
NOTE:
The last two coils listed were BC coils, available as a pair for $5.60. Apparently, if you were a DX hound, BC listenings were looked down upon.....



BREMER-TULLY CIRCUIT № 1, 1923

Rheostats to suit tubes used.
A 1-tube set exists w/o the AF stages,
from the dotted line.

BREMER-TULLY CIRCUIT #2, SECOND VERSION

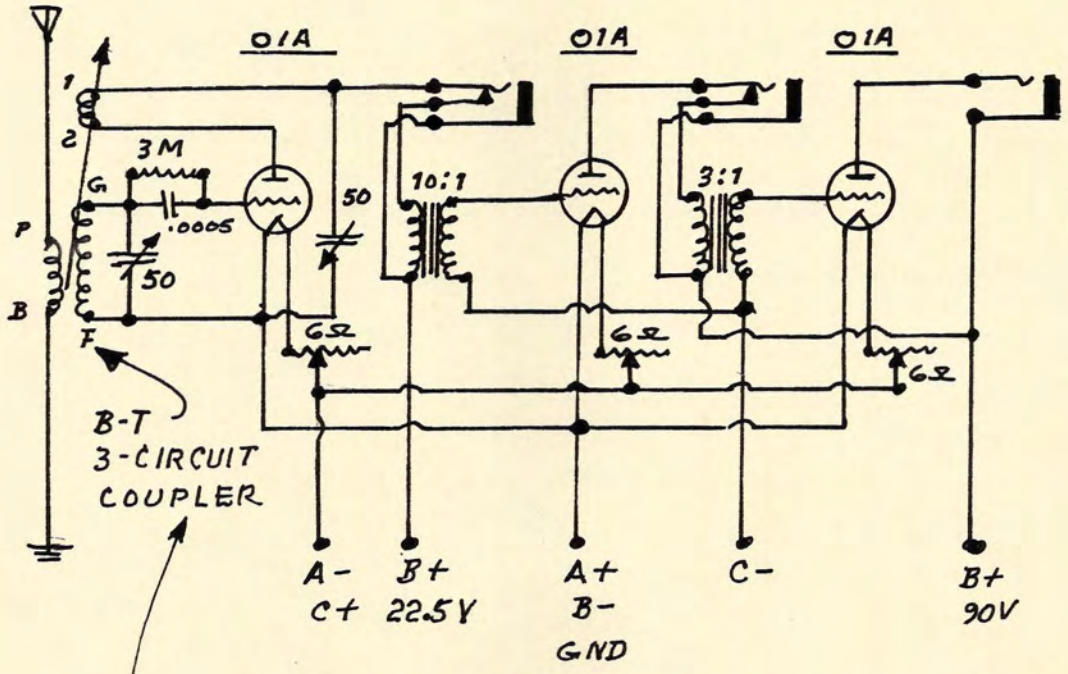


BREMER-TULLY CIRCUIT Nº 2

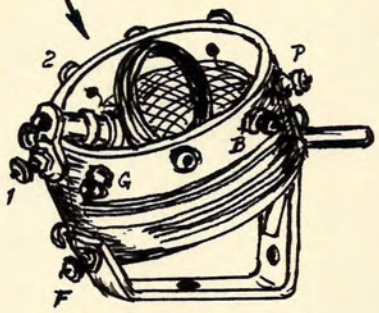
A modification of the Reinartz, using as inductance the B-T 2, original tuner.

AF XFRMS. = 3.2:1 x 2

BREMER-TULLY CIRCUIT No. 4, 1923

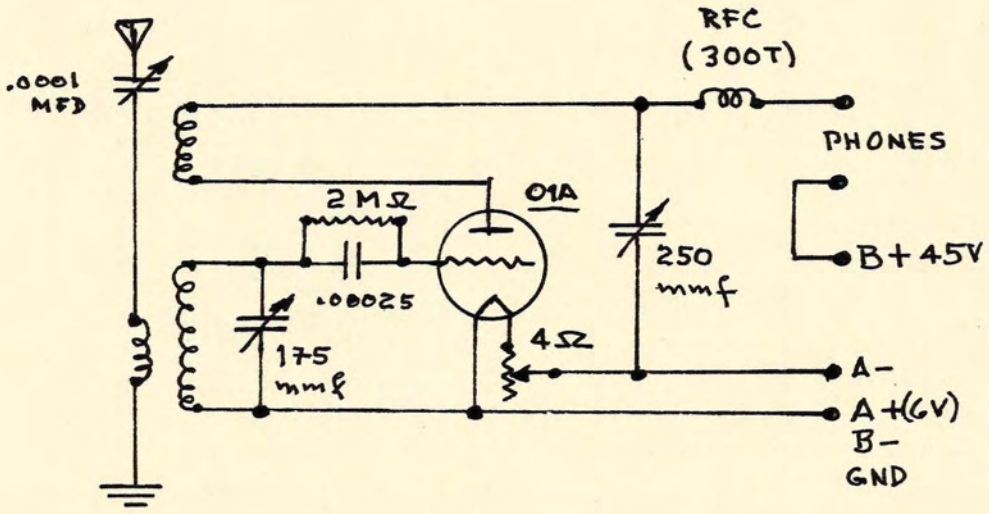


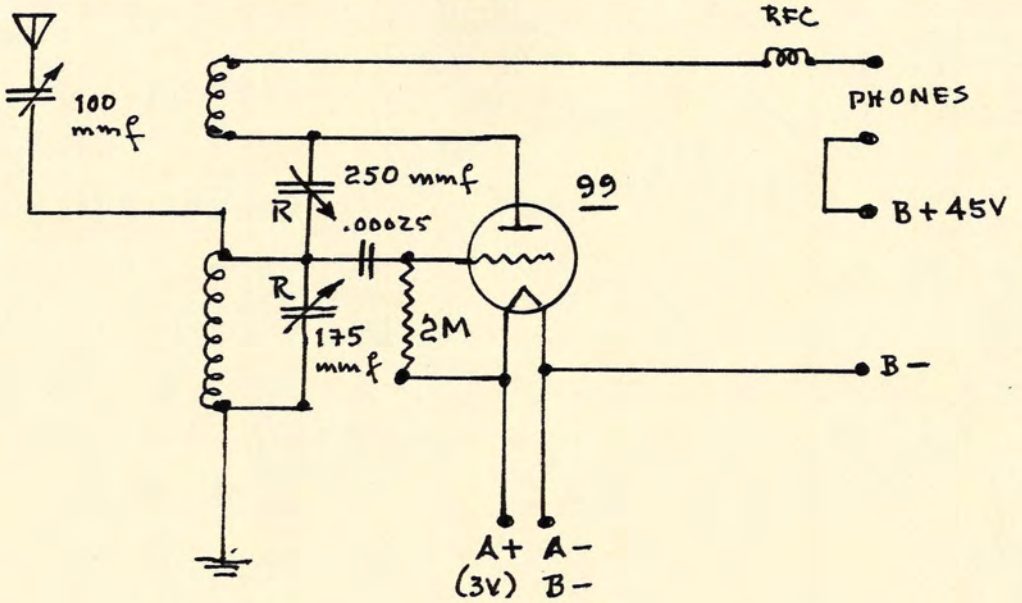
NOTE: With 99 tubes, use a 25Ω Rheostat, in lieu of the (3) 6-Ω shown.



BREMER-TULLY "UNIVERSAL VERNIER" TUNING UNIT COUPLER - 1922 - $5.

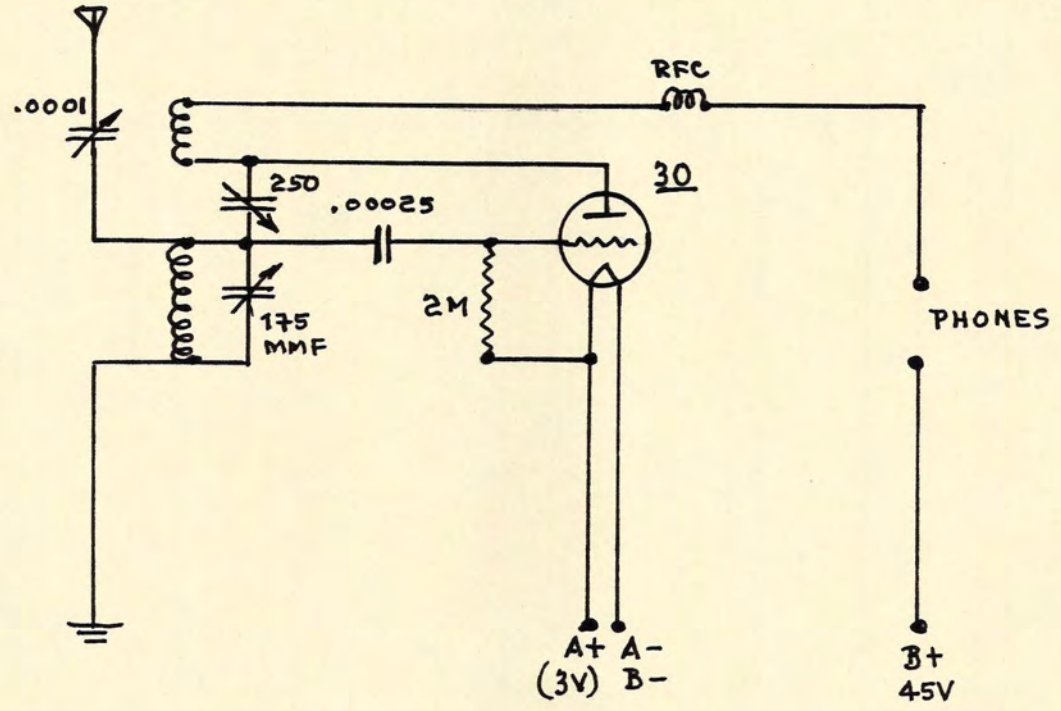
TWO EARLY BREMER CIRCUITS, 1923

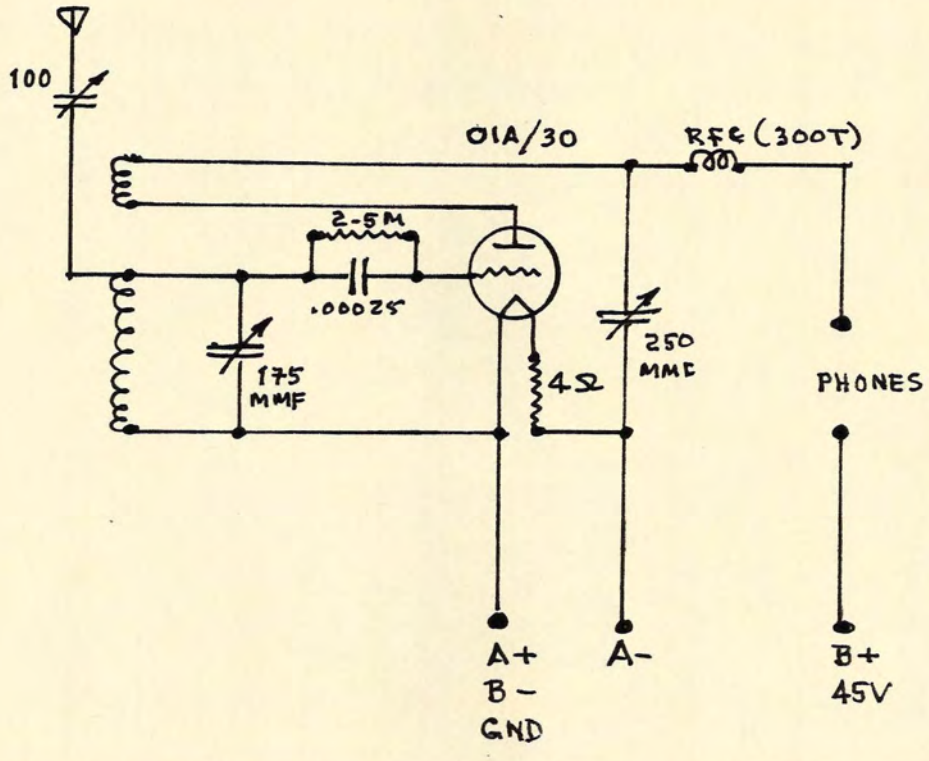




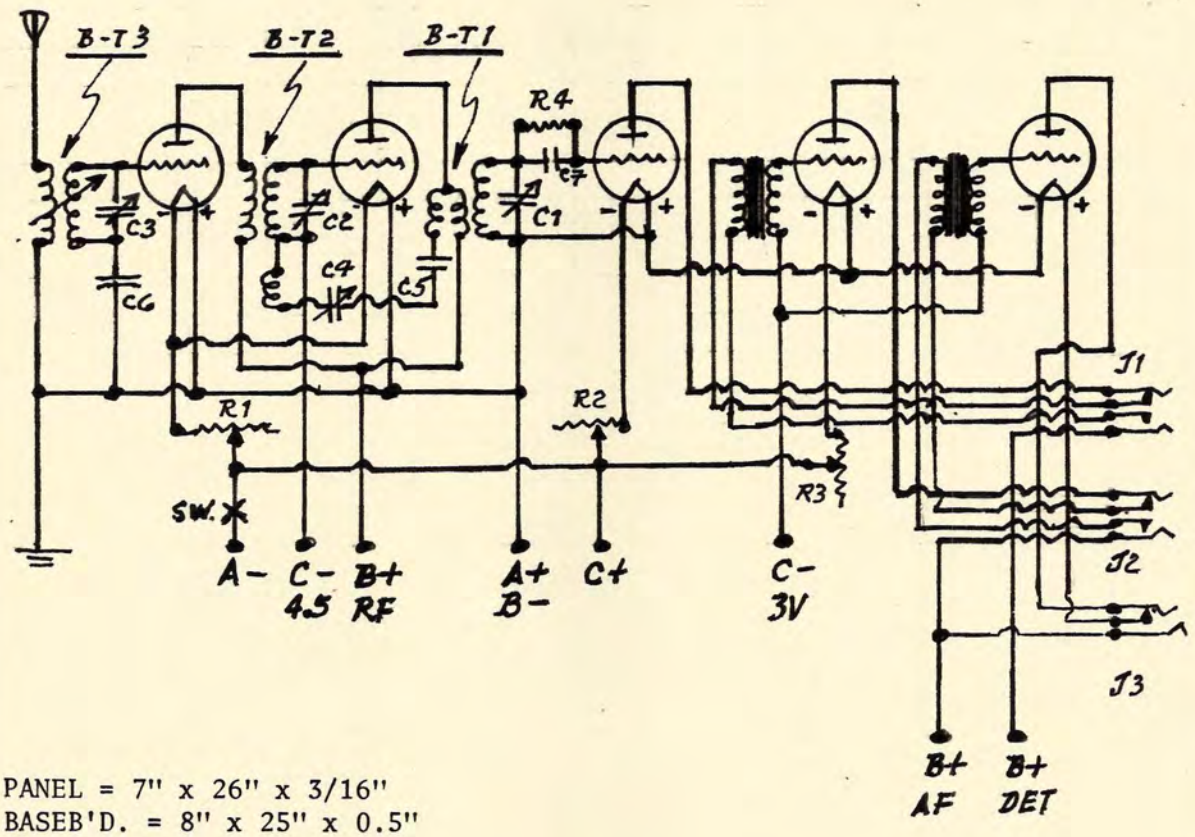
(FILE)

B-T ONE-TUBE SW. RECEIVERS, 1926-1928





BREMER-TULLY "NAMELESS" CIRCUIT, 1924
(Sht. 2)



PANEL = 7" x 26" x 3/16"
BASEB'D. = 8" x 25" x 0.5"

C1, C2, C3 = .00025 MFD
C4 = 40 MMF, 3 Plate
BT-1, -2, -3 = B-T Xfrmrs.
J1, J2 = Double Circuit Jacks
J3 = Single Circuit Jack
C5, C6 = .001MFD
C7 = .00024 MFD
R4 = 3M Ohm
R2 = 6 Ohm Rheostat (3) (R1, R3)
Binding Posts = 8

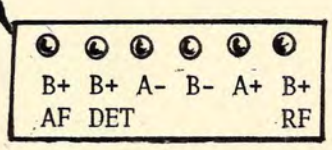
BATTERY TERMINAL STRIP = 1" x 6.5" x 3/16"
ANT & GND STRIP = 1" x 2.5" x 3/16"

"C" BATTERY SEPARATE

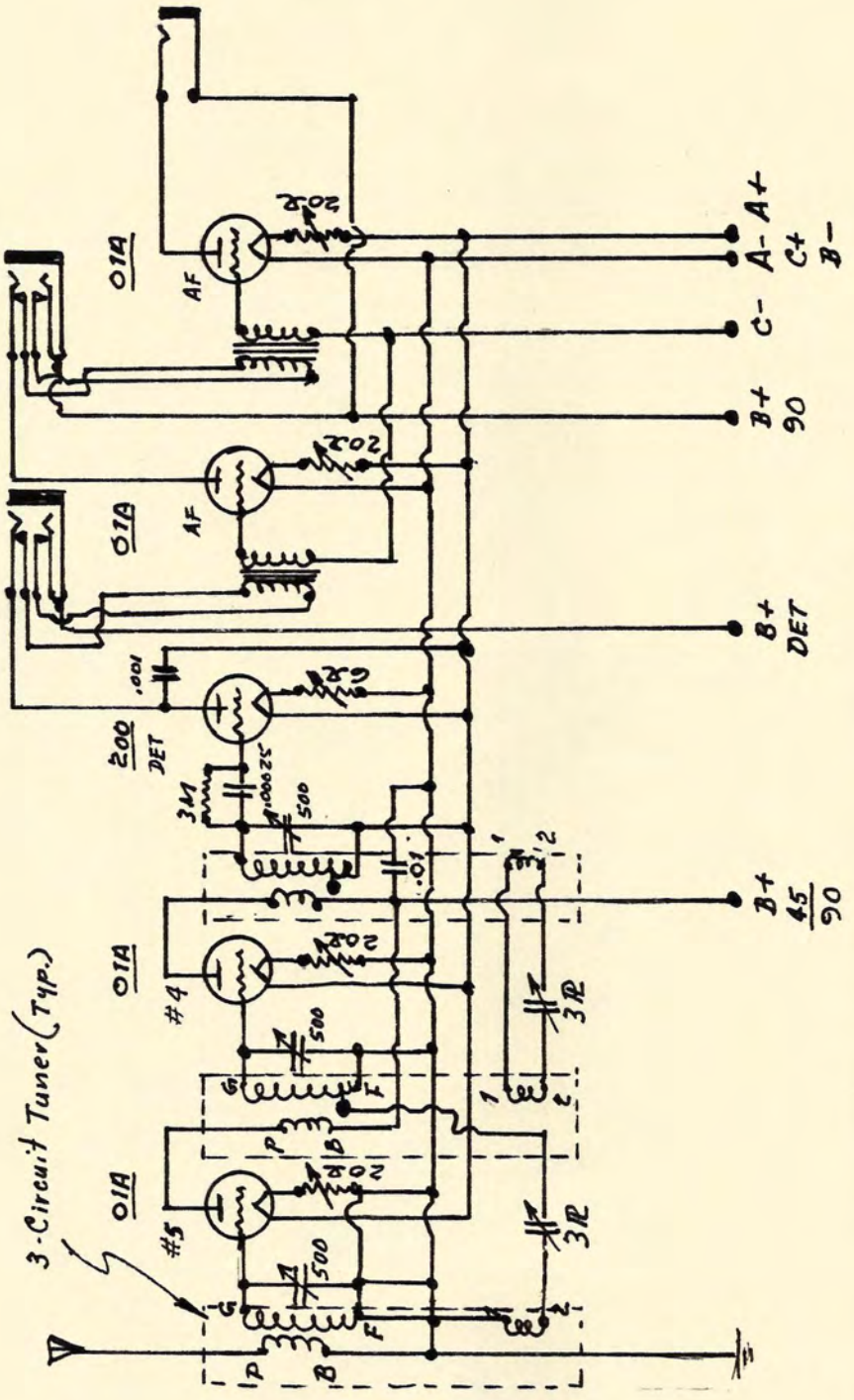
R1 controls the first 2 tubes.
R2 controls the DET.tube.
R3 controls AF tubes.

When plug is inserted into J3,
AF tube is controlled by R3 only.

The 2nd AF tube does NOT light
unless SPKR is plugged into J3.

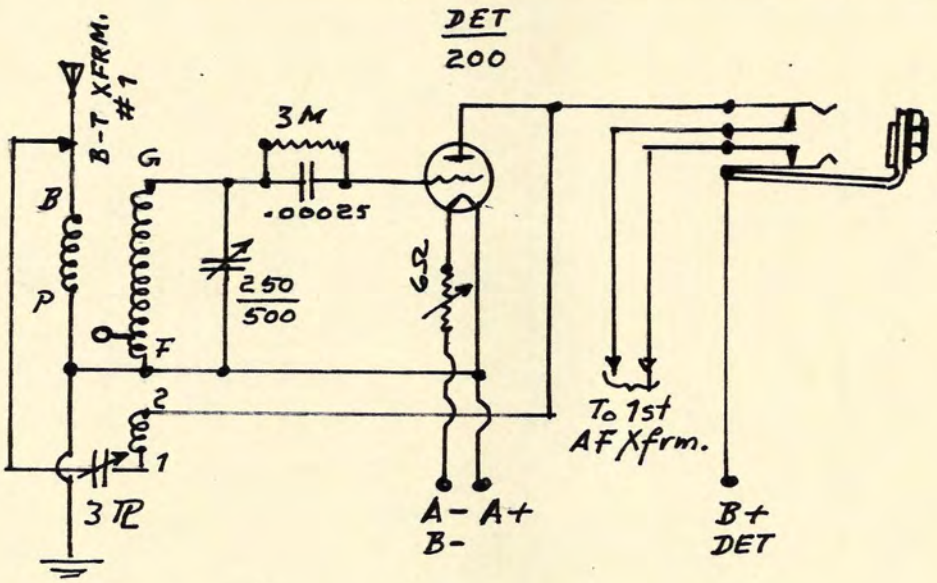


BREMER-TULLY "NAMELESS" TRF KIT #3; 1924



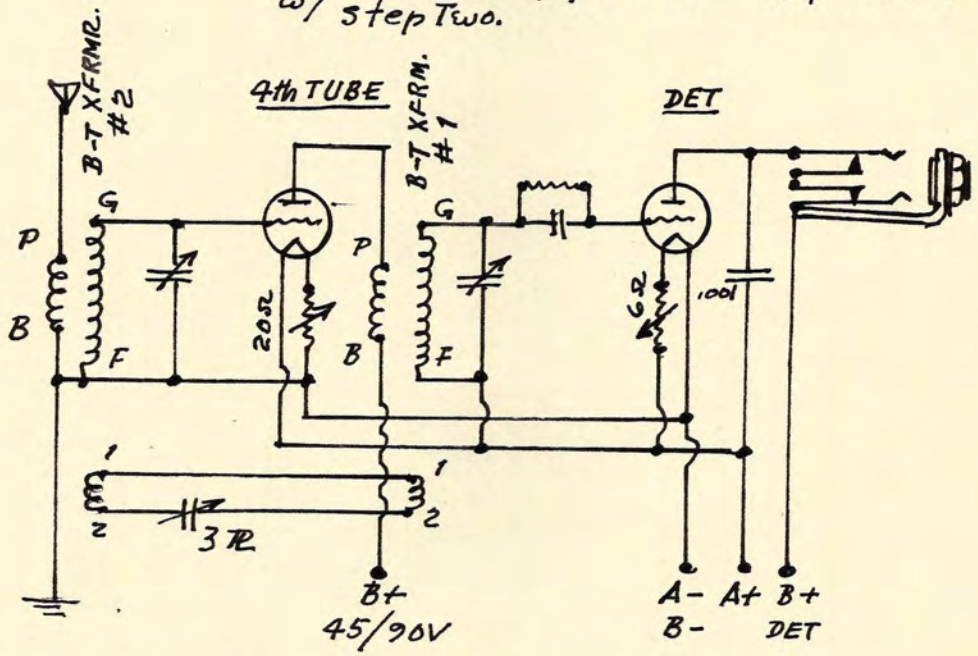
THREE B-T 3-Circuit RF Xfrmrs. EMPLOYED.

BREMER-TULLY's ORIGINAL INSTRUCTIONS FOR THE "NAMELESS"



STEP ONE: DETECTOR ONLY HOOK-UP

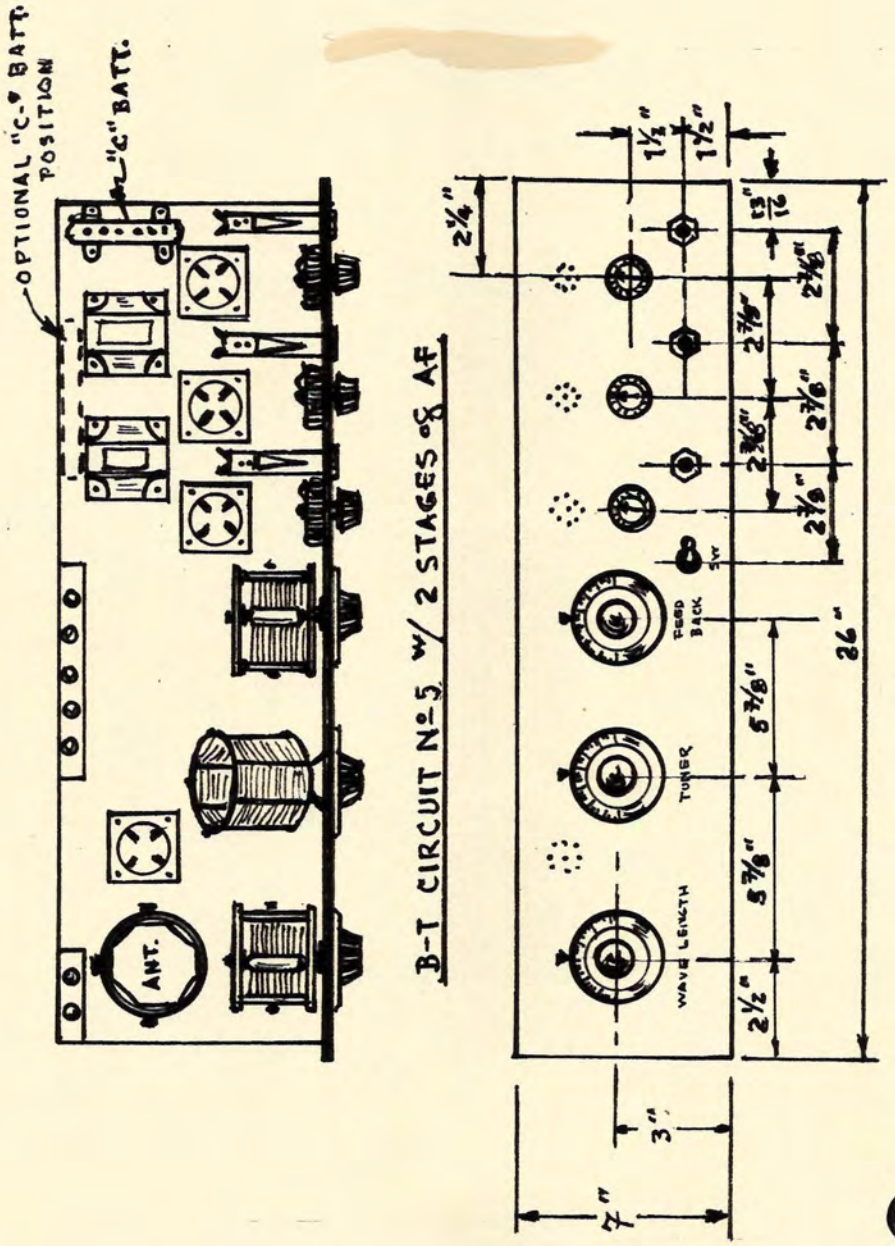
Test on air; if functioning, procede w/ step Two.

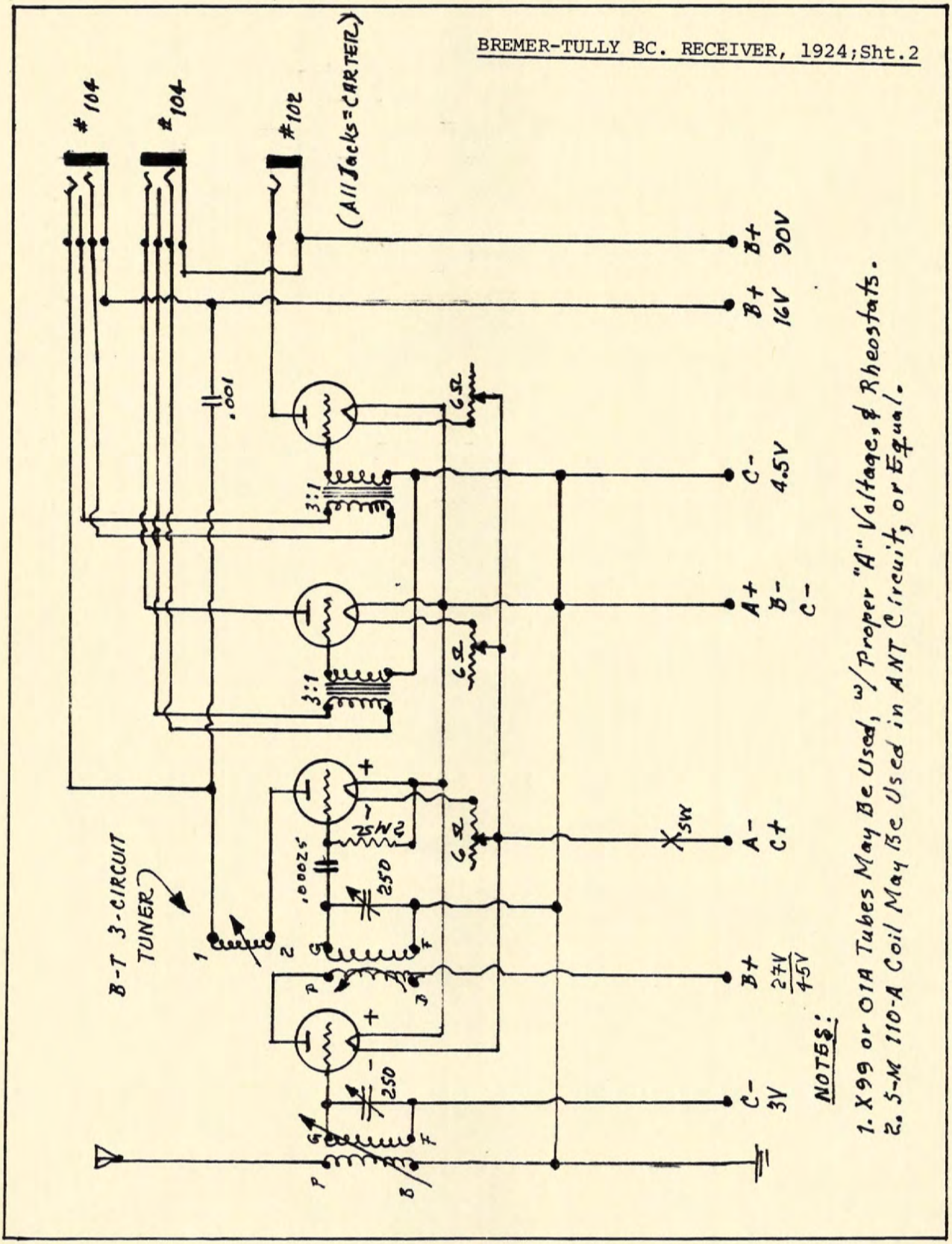


STEP TWO: 1st RF STAGE HOOK-UP

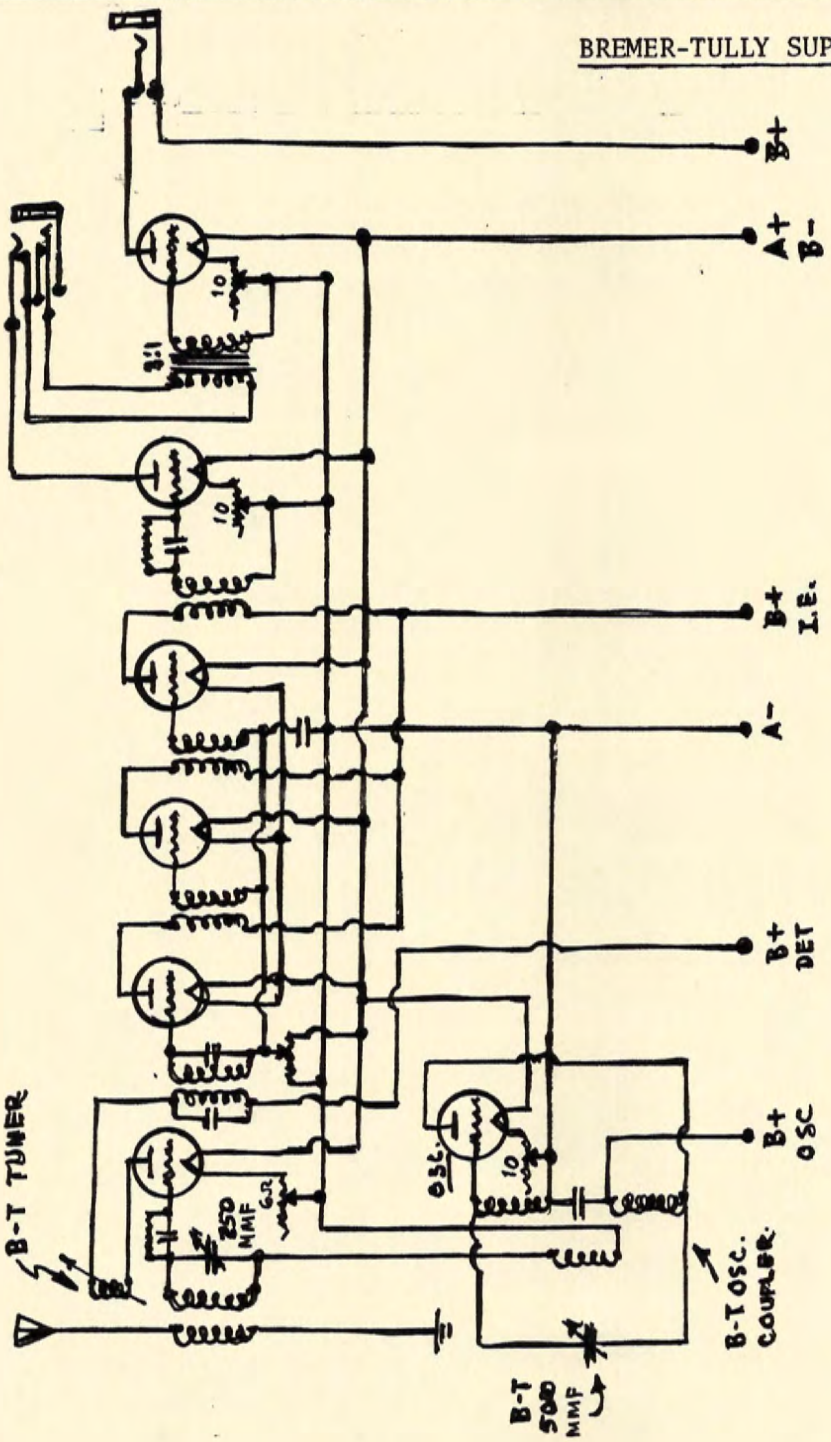
Test on Air; if functioning, add 5th tube (see schematic); then AF tubes.

BREMER-TULLY BC. RECEIVER, 1924



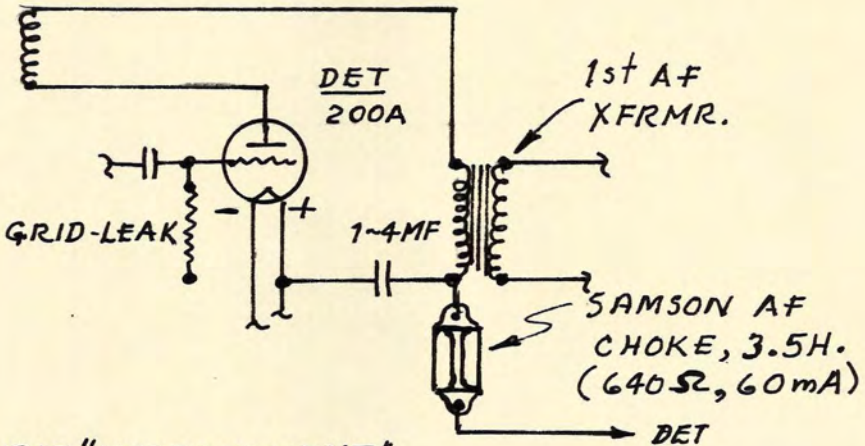

BREMER-TULLY BC. RECEIVER, 1924;Sht.2
#104
#104
#102
(All Jacks=CARTER)
.001
6Ω
3:1
3:1
B+ 90V
B+ 16V
C- 4.5V
A+
B-
C-
A-
C+
SW
B+ 27V 45V
C- 3V
B-T 3-CIRCUIT TUNER
.00025
25Ω
250
250
NOTES:
1. X99 or 01A Tubes May Be Used, w/Proper "A" Voltage, & Rheostats.
2. 5-M 110-A Coil May Be Used in ANT Circuit, or Equal.

BREMER-TULLY SUPER-HETERODYNE, 1925

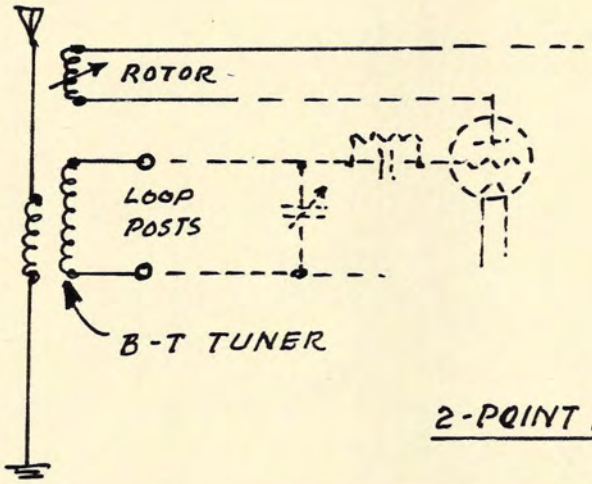


There is practically no information available on this circuit. It apparently was an experimental circuit that never got off the ground, as the next public announcements by Bremer-Tully were for their "Counterphase" kits. I have applied "Counterphase" constants and values to the above and they worked out quite well, which gives credence to the supposition that it was a forerunner of the "Counterphase" series.

BREMER-TULLY INCIDENTAL NOTES



AN AUDIO "IMPROVEMENT" TO THE "Counterphase", SUGGESTED BY GERALD BEST, 1927.

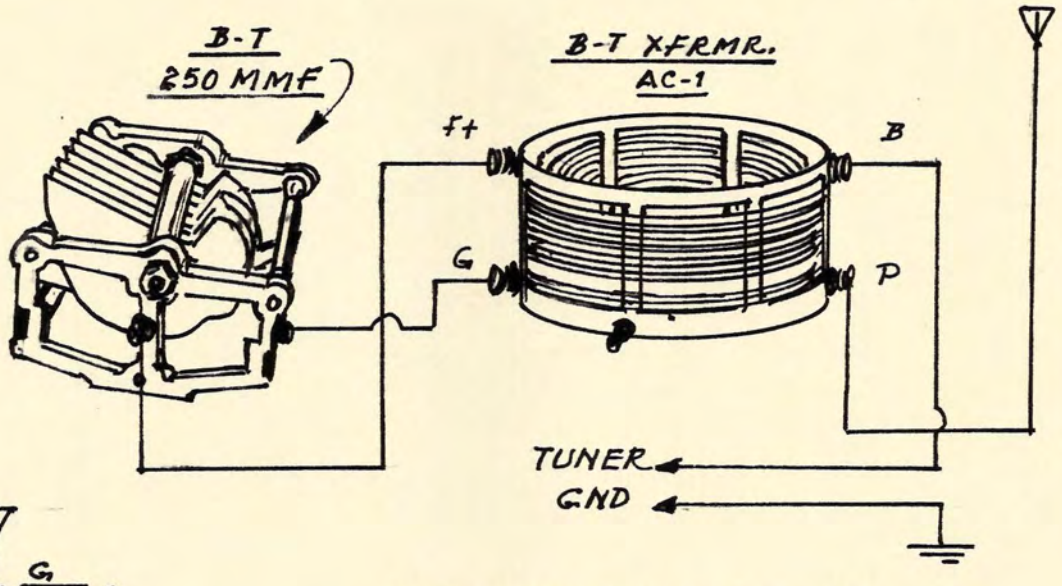


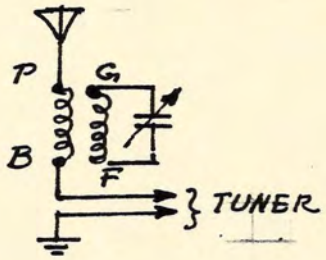
2-POINT LOOP CONNEXIONS (1925)

NOTICE

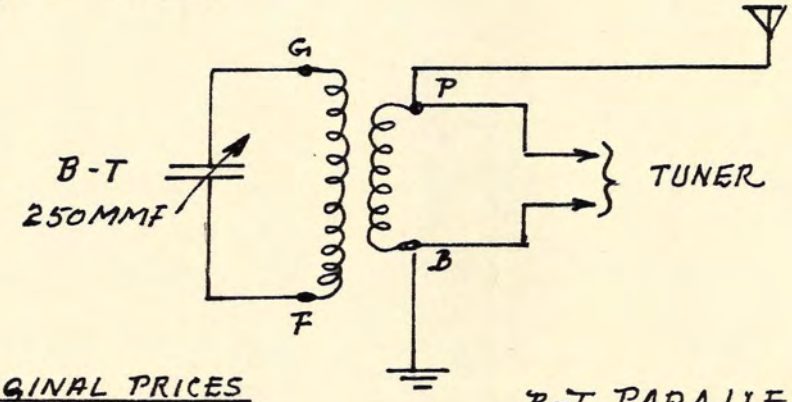
The B-T "Universal Vernier" tuning coil assembly of 1922 was not the same as the subsequent B-T 3-Circuit Tuner of 1924, although they were interchangeable in some circuits, mainly 1-tube jobbies.

BREMER-TULLY WAVE-TRAPS, 1928





B-T SERIES WAVE-TRAP



B-T PARALLEL
WAVE-TRAP

ORIGINAL PRICES

AC-1 = $2.50
250 mmf = 4.25
(1928)

Counterphase Receivers

The Counterphase Circuits of B-T enjoyed wide popularity well into the Thirties, and would have to be ranked with Lacault's Ultradynes, Sargent-Rayment's Infradynes, Grimes' Inverse Duplex, as well as the outstanding Victoreens as a distinct advance in the Radio art of the period.

There were actually two series of Counterphase circuitry, and some confusion was engendered even among media editors. The original series employed the B-T Torostyle coils; the later Counterphase circuits employed more conventional RF coils.The confusion was abetted by the fact that the Counterphase Six and Eight used five and seven tubes, respectively. Harry Bremer gave the following explanation:

> *"It is the number of "tuned" stages that is important. In the "Eight" there are five tuned stages - five condensers turning simultaneously with the station indicator, and three audio stages, including the power one thus making eight in all. The rejector stage, however, has no tube for the reason its principle purpose is to increase selectivity, and in this circuit, it is more selective without a tube. It would be unfair, we feel, to the receiver to classify it as a "Seven" when there is greater selectivity that if it had eight tubes, and we have called it the Counterphase-Eight."*

The Counterphase designation endured until the early Thirties when it was replaced by numderical model numbers - *e.g.*, 6-13, 8-20, 7-70, etc., details of which will be found hereinafter. The latter-day B-T receivers were extremely well-made, offered in handsome cabinets, and worth having. B-T's original Counterphase circuitry originally was offered only in kit form; the latter-day receivers never.

Unfortunately, while the restoration of the Counterphase sets is relatively easy enough, they all suffered from the bane of modern restorers because of the extensive use of pot-metal in the variables and their pillow-block supports. Like all early pot-metal component parts, they were prone to crack, disintegrate, freeze, and rarely is it possible to repair them. The metallurgical state-of-the-art, has,

of course, advanced consideably since the Twenties, but that does not preclude having a lovely Counterphase Eight sitting inoperatively upon your shelf and feeling frustrated, and perhaps a bit sad.

Like all early circuit designs, the Counterphas circuit had a theory behind it, which is detailed in the following paragraphs.

THE COUNTERPHASE CIRCUIT THEORY:

Like other radio pioneers of his time, Bremer was concerned in theory with the inevitable oscillation that occurred whenever one added additional RF stages to a regenerative circuit. While added stage of RF contributed markedly to the overOall efficiancy of the set, the resultant increase in magnitude and amplitude of oscillation was not a desirable result. This oscillation was due to feed-back from excess plate energy flowing to the grid of the circuit through the capacity existing between grid and plate. This feed-back was generating those well-known whistles and howls whenever a signal was tuned in. At resonance, feed-back would swamp the signal.

To maintain maximum signal in the grid circuit, a condition of resonance in the tuned circuit had to be maintained, but also allowing the use of the low grid circuit by limiting the energy feed-back from plate to grid. As the tendency to oscillation was not uniform at all frequencies, the problem was compounded. At that time, 90% of all BC frequencies were crowded into the lower half of the scale, thereby eliminating any hope of a fixed control.

The non-predictability of oscillation was true regardless how the circuit was neutralised at some mid-frequency, or had enough loss introduced into the circuit. Both techniques were only partially successful at either end of the scale. What Bremer and Tully were after, it seems, was a control whereby the circuit might be kept at a point just below that of oscillation at all frequencies or wavelengths. The Counterphase Circuit was the first practical method of controlling RF amplification of three stages as easily as one or two.

The 'secret' of the Counterphase Circuit was in the three patented semi-variable capacitors and the toroidal coils of square cross sexion. (For full electrical and physical specifications of the coils refer to Vol. VII of theVintage Radio Idnetification Sketch-Books.)

Simply stated, decreasing the capacity of the condenser tended to increase the tendency to osicllation. Introducing a resistance into series with the condenser would counteract this tendency. Each RF stage had its grid and plate circuits with like and reverse windings, respectively, coupled by fixed capacities, which were set once. Also, there was the added advantage of the Counterphase Circuit that it did not lend itself to detuning effects, thus permitting the use of only

two controls for three stages of RF. The need to introduce losses into the circuit, a common practice of the time, was obviated, and the grid circuit was allowed to remain in low resistance condition.

The original Counterphase Circuit was patented in 1925.

In the following pages you may trace out the evolution of the Counterphase saga, which you should find interesting. The early, 1925 to 1928, sets are easily constructed - those employing the Torostyle coils - and work quite well. The use of a "hard" detector tube allows all tubes to be controlled by a single rheostat.

The original circuits called for a dual-range variable resistor, the theory being that manipulation of such would balance volume and sensitivity simultaneously, in terms of local and distant signals and the usual "hash", but was quickly discontinued. Two seperate, and coupled in series, rheostats may be used. Needless to say, parts comparable to those specified will work equally well.

* * *
* *
*

ADDENDUM

Simply by way of further edification, the following is an extract from the original Bremer patent:

"The Counterphase method secures a balance which will keep the circuit just below the point of oscillation...The counterphase method couples a coil to the primary in such a manner as to transfer a "counter" potential - i.e., energy in a reverse direction to that which would cause oscillation, the action therefore being almost exactly opposite to the so-called regenerative principle. The proper amount of "counter" potential necessary to balance out the objectionable feed—back is controlled by a smallcondenser connected to "T" on the ANT coil."

* * *
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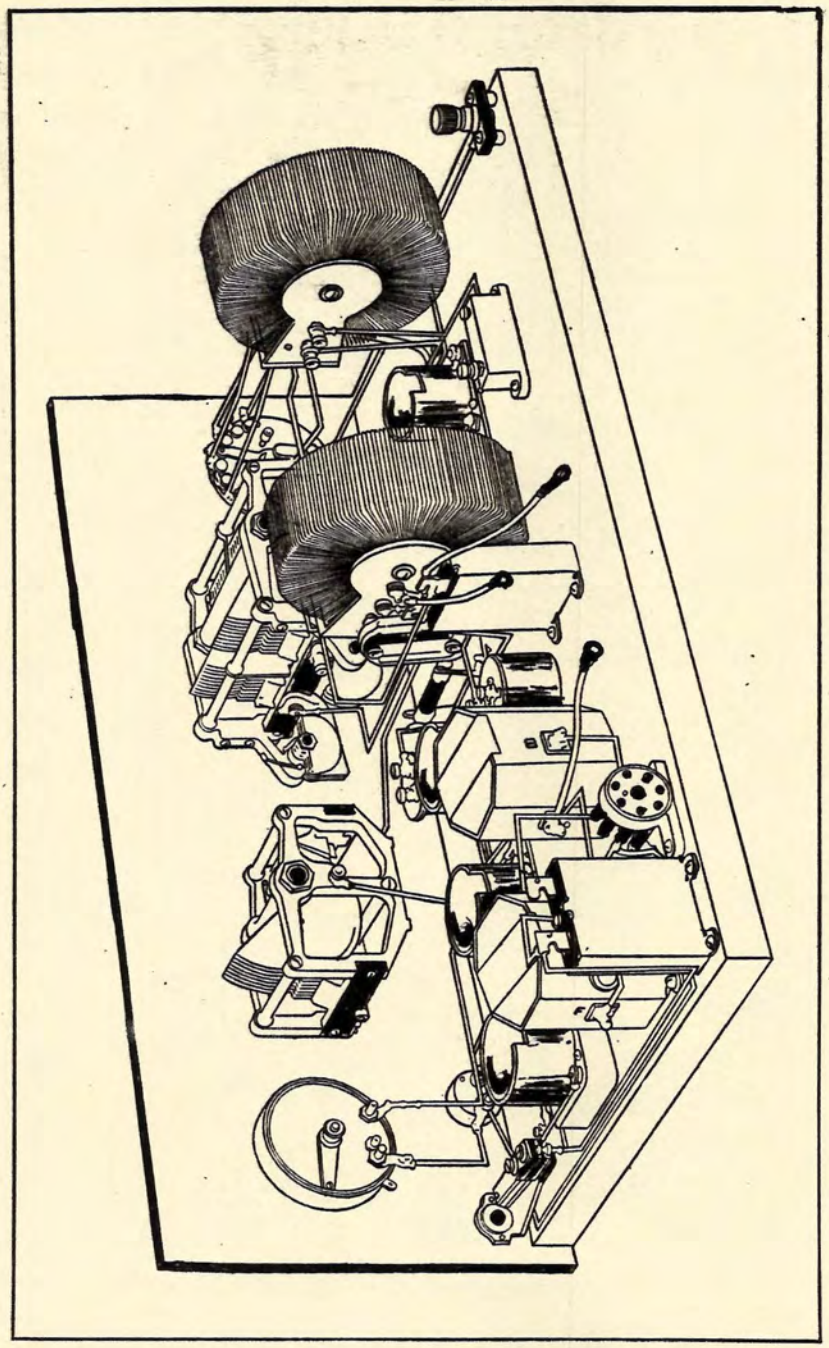
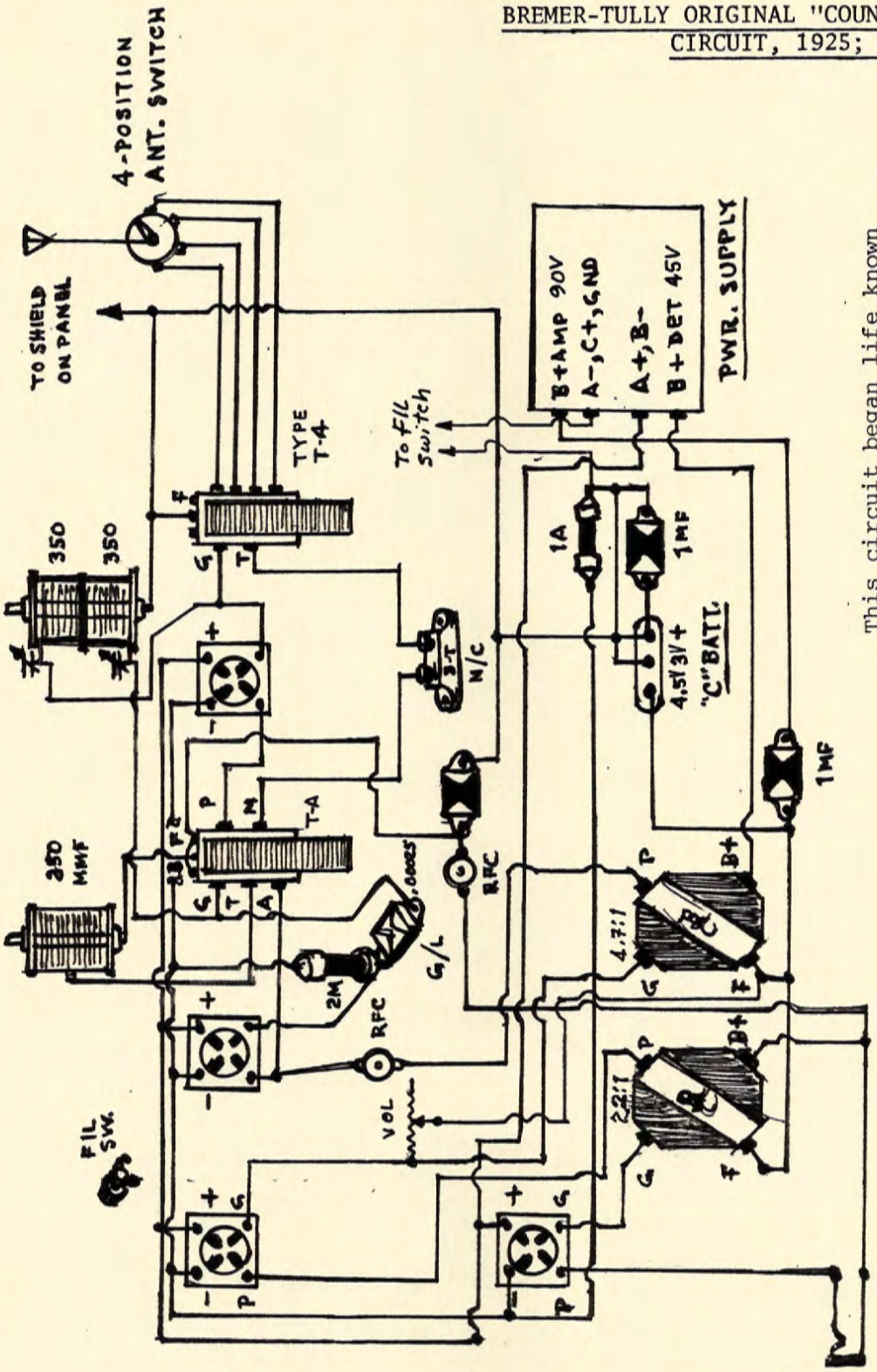


THE B-T-FOUR

(THE ORIGINAL "COUNTERPHASE".)

BREMER-TULLY ORIGINAL "COUNTERPHASE" CIRCUIT, 1925; Sht. 1



This circuit began life known as the B-T FOUR, and the term "Counterphase" was originally applied to the method of oscillation control, only.

(See also the Frontispiece this Section.)

THE ORIGINAL "COUNTERPHASE" CIRCUIT; Sht. 3

GENERAL NOTES:

The shield referred to on the schematics refers to a thin copper sheeting placed behind the panel and, if used, cabinet walls. The variable may be left in contact with the shield, but it is neccesary to insulate the jack, selectivity switch and the volume control.

The Amperites shown control the proper FIL voltages, thus obviating the need to ever de-tune the FIL to lower the VOL which tends to overload the tubes, anyway. While VOL may be decreased, it impairs tonal clarity. The VOL control shown actually increases the clarity as the volume is turned down.

FINDING THE STATIONS:

1. Adjust the small balancing condenser to the minimum capacity (pointer at the highest point).

2. Tune in a weak signal at about 300 meters.

3. Rotate the dial back and forth across this signal until a beat-note or whistle is heard.

4. Increase the capacity of the balancing condenser (Mikro-Mike) until the beat disappears when the dial is rocked.

5. When the beat disappears, turn the small condenser one-eighth to one-quarter beyond this point. If necessary, disconnect the ANT.

6. If the rear trimmer is set at the right point, the front trimmer of the tandem variable will show best results at about its mid-point, and no further adjustments are necessary.

While 99 tubes are referenced on the variant of the B-T FOUR, you will find 01As are superior. Clarification: the 99 should be X99, not V99. The original B-T FOUR had loose leads in place of the later multi-plug for the B-supply.

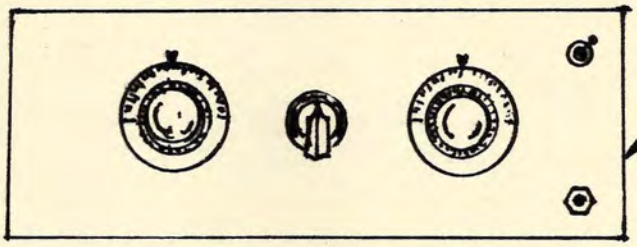
* * *
* *
*

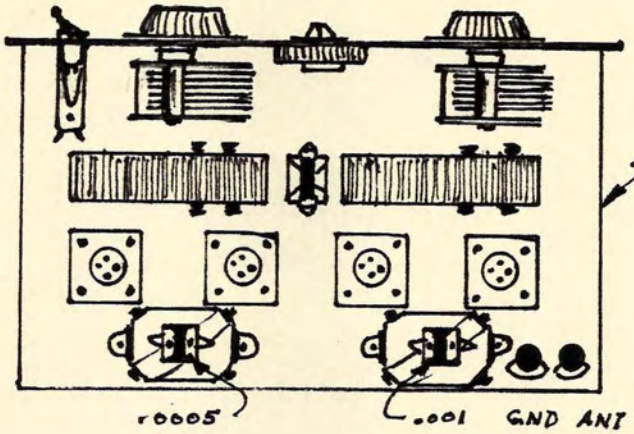
A BREMER-TULLY ADAPTATION, 1926

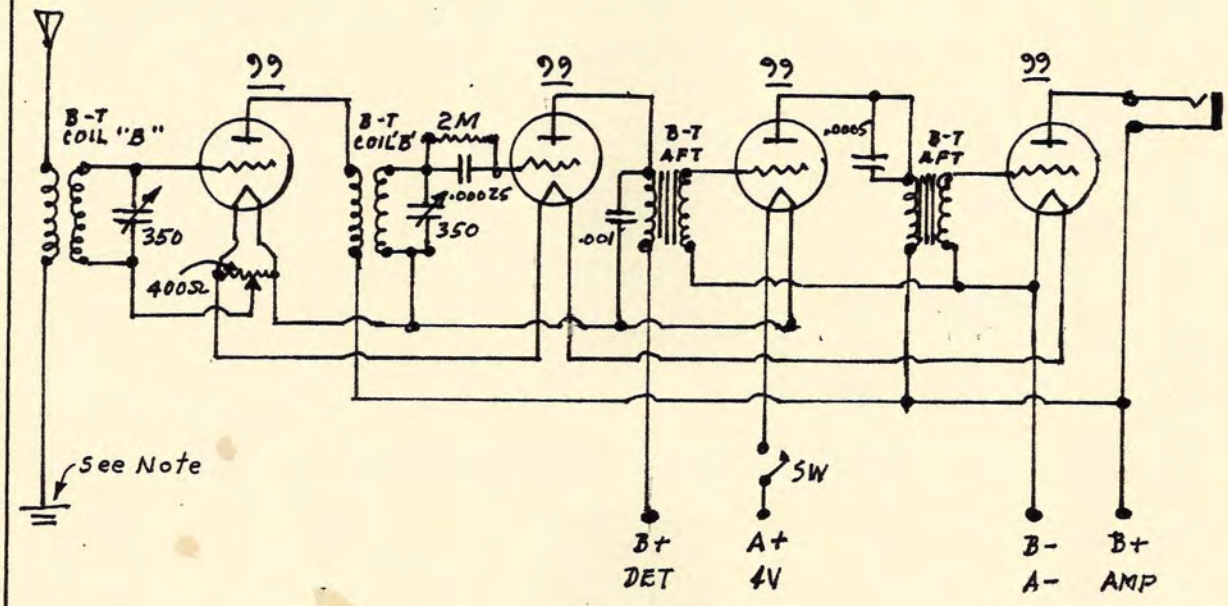
COMPONENTS

Remler Dials.
Pacent Pot.
Bruno Brkts.
B-T Torostyle coils: "B".
B-T Europhonic AF xfrmrs.

NOTE: The Bruno brackets acted as GND.

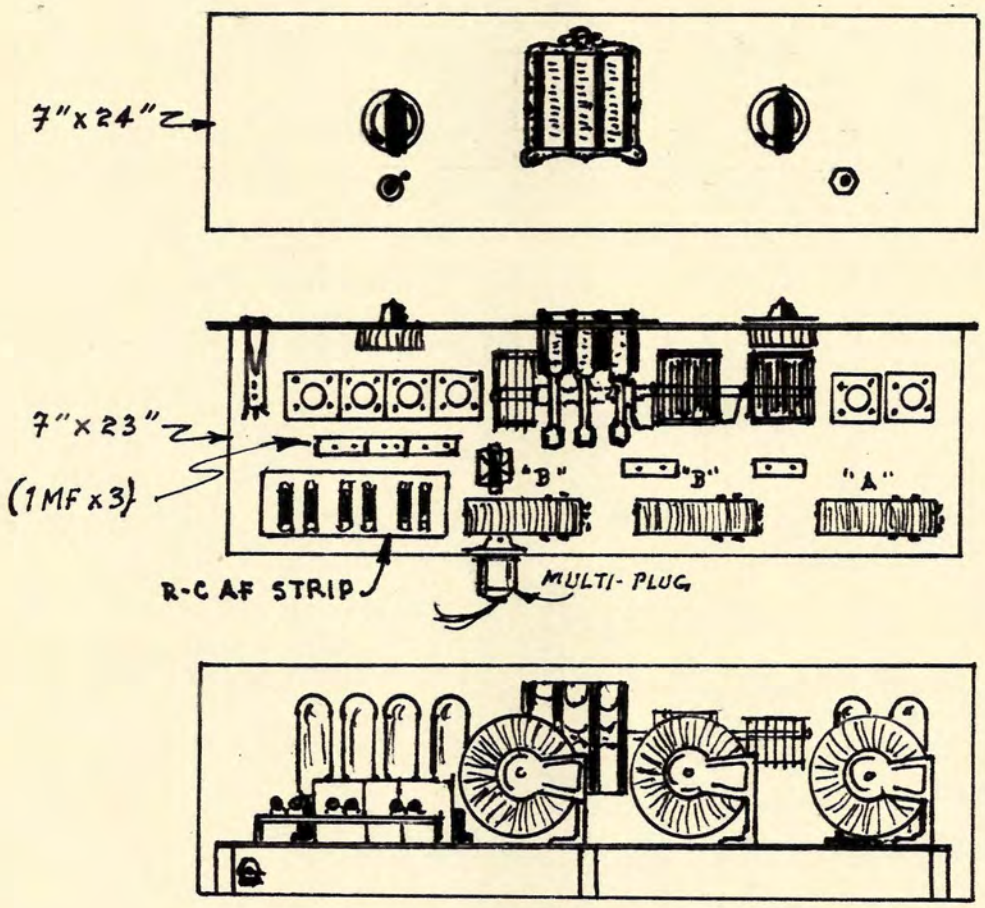






(RN 8-26)

THE "EUSONIC" - A BREMER-TULLY ADAPTATION, 1926: Sht. 1

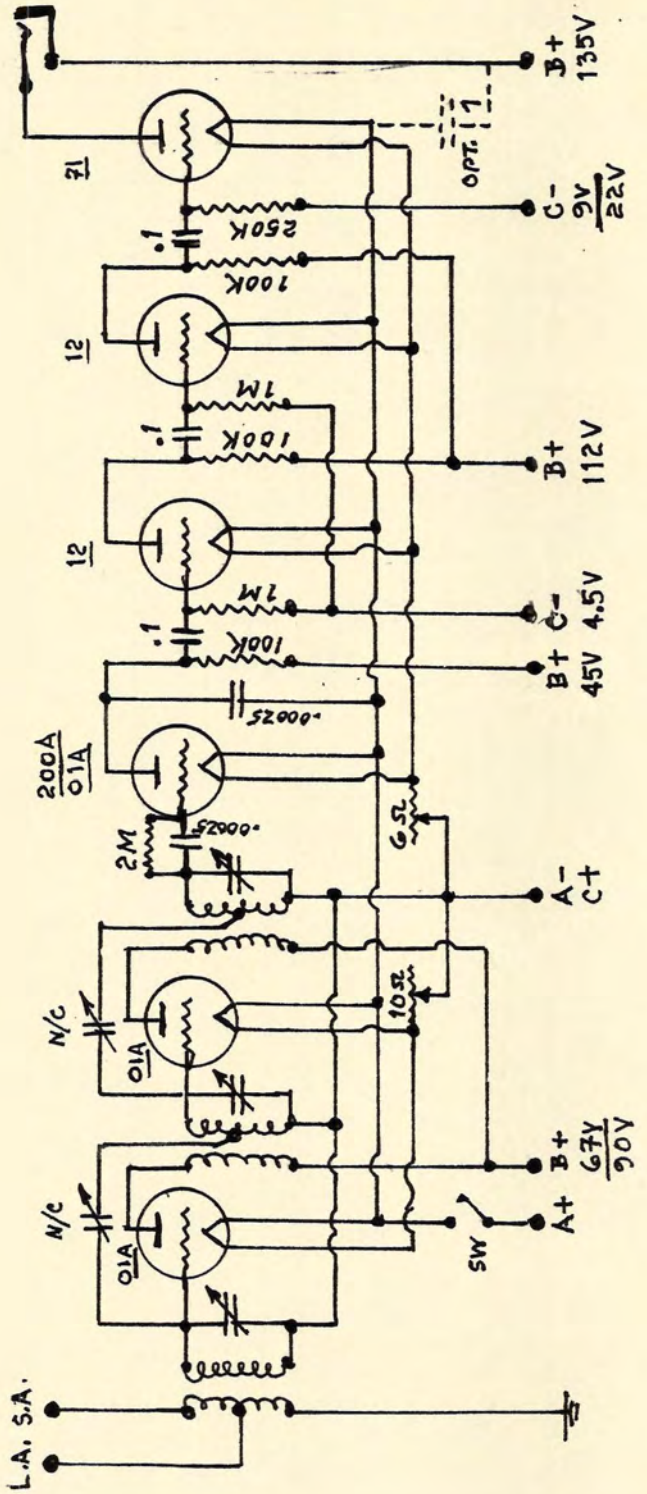


PARTS LIST

(3) B-T Torostyle Coils; "A" & (2) "B".
ALDEN 3-gang "Localised Control" Variables.
(2) PACENT escutcheons with knobs.
Multiplug connector - Jones, Frost, etc.
(3) 1mf Condenser.
10-Ohm rheostat.
6-Ohm rheostat.
(2) B-T "Micro-Mike" neutralising Condensers.
(3) DAVEN "Resisto" coupling units.
Grid-leak assembly - 2M-ohms/.00025mf.
Single-circuit jack.
FIL switch - Carter, Frost, Jones, etc.

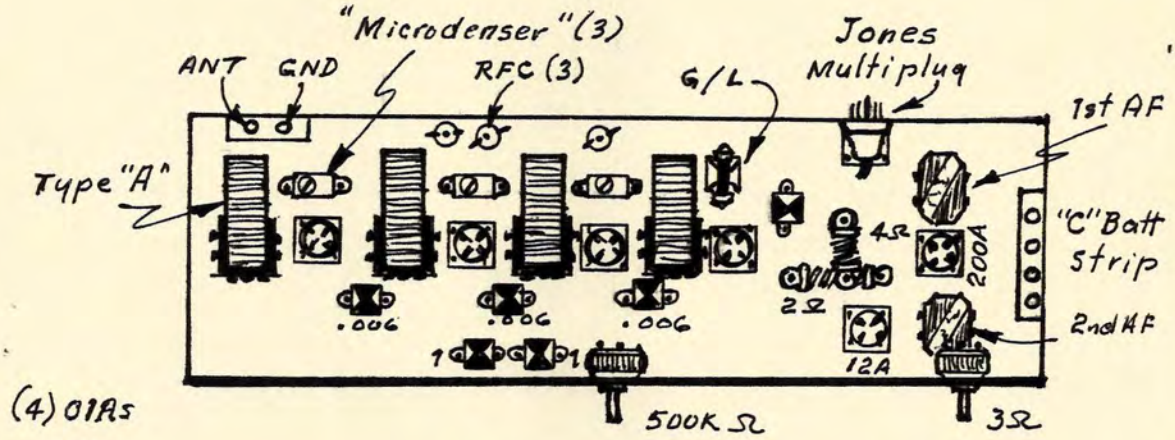
(RN 9-26)

THE "EUSONIC"; A BREMER-TULLY ADAPTATION: Sht. 2

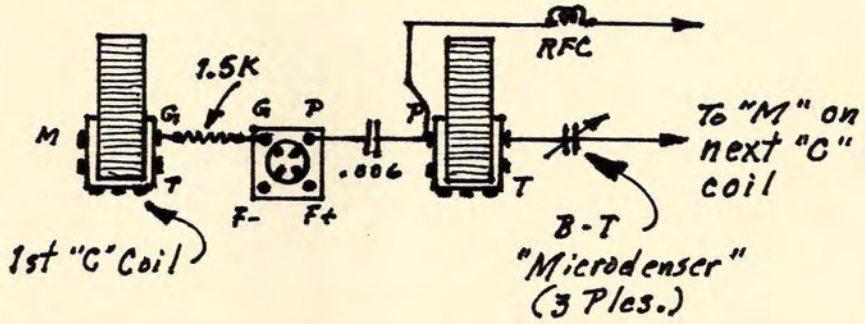


NOTE: The testing and aligning of this set is the same as for the earlier "Counterphase" circuits.

B-T "COUNTERPHASE 6", 1926:Sht. 2



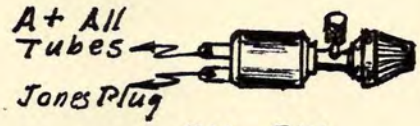
FIRST VERSION, 1926



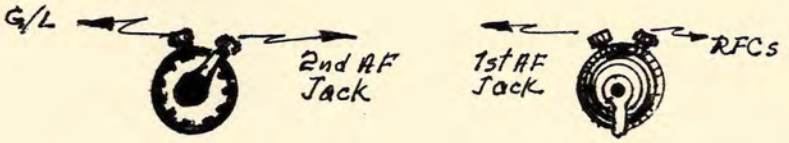
TYPICAL TORODIAL COIL CONNEXIONS (Typ. 3 Places)

REFERENCES:

RA	1-27
RB	1-27
RD	11·28·'26
RN	1-27
RI	1-27
RLG	1-27
OTA	1-27
PM	2-27
CB	12·26



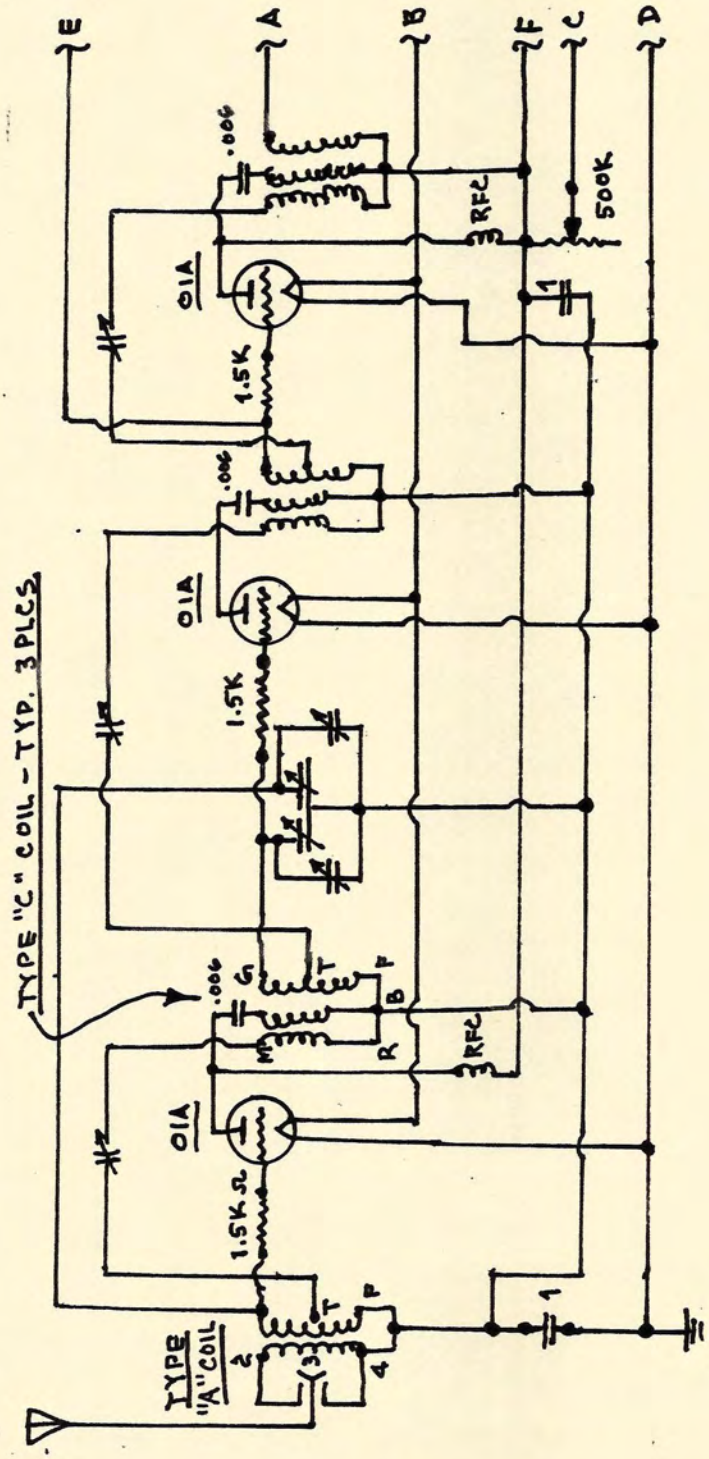
FIL SW



3Ω RHEOSTAT

500K Ω

MODERNIZATION OF BREMER-TULLY "COUNTERPHASE SIX" - 1926 (Sht. 3)



NOTES:

Connexions are identical on all "C" coils.
Refer to Sht. 2 for proper placement of parts.
B-T components used throughout.

MODERNIZATION OF THE BREMER-TULLY "COUNTERPHASE SIX"

(Applicable to later version of the 1926 model only.)

1. Use 01A tubes; with 12 in last audio stage; 200A as DETECTOR.

2. C-Bias battery must have -3, -4.5, -9 volt taps.

3. 1500 ohm resistors are attached to "G" terminal of each RF coil direct; other connexions to free end of resistor.

4. C-Bias battery must have separate binding post - i.e., not with B-,

5. Connect 6V battery to terminals as shown on schematic;

   a) insert all tubes.
   b) test all tubes via FIL switch.
   c) touch A+ lead to each of the other terminals - no tube should illuminate.

6. Install "B" and "C" batteries.

7. Rotate dials together; rock until a signal is heard.

8. Adjust trimmers to suit.

   a) seat right hand variable condenser trimmers.
   b) rotate panel trimmer (of variable) rapidly as SELECTOR dial is moved slowly a few degress to each side of maximum intensity.
   c) panel trimmer is useful on very weak signals.

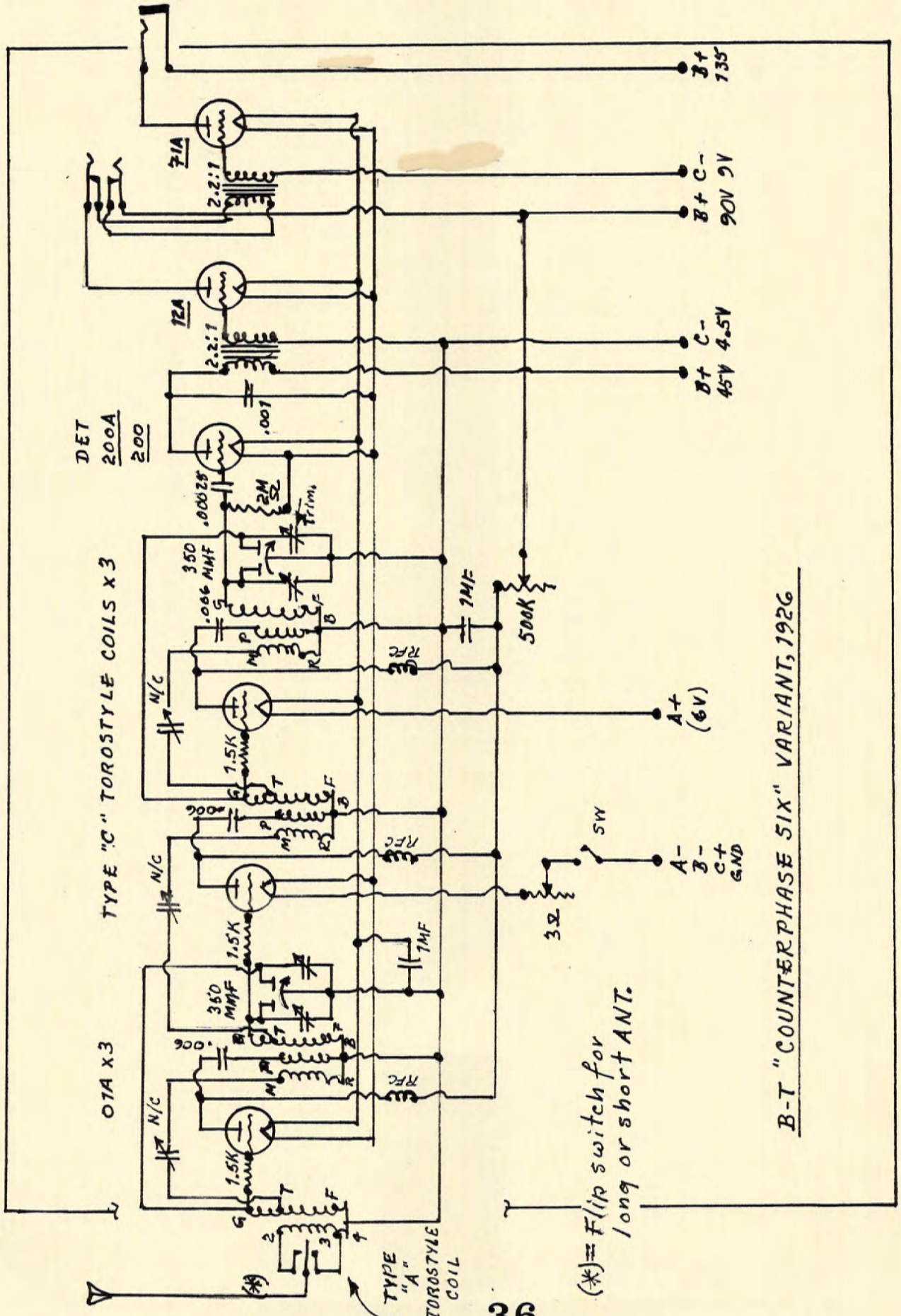
9. Balance out RF amplifier stages as follows:

   a) set VOLUME control at highest point.
   b) disconnect one "A" lead from 3rd RF tube socket: signal should still be audible.
   c) turn screw on balancing condenser next to tube until signal weakens or disappears.
   d) retune right hand dial until signal is loudest; use panel trimmer if necessary.
   e) readjust balancing condenser until signal is weak.

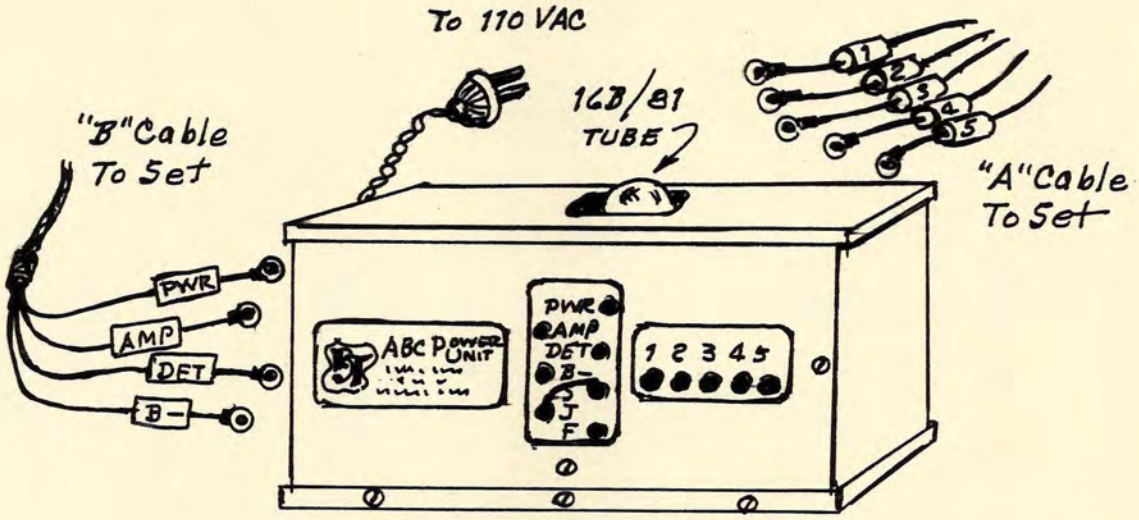
10. Replace "A" lead, and retune the set.

11. Repeat balancing procedure for 2nd, then 1st RF tubes.

12. In adjusting 1st & 2nd tubes, detune 3 rd tube and DET stage until volume is fairly weak.


B+ 135
B+ C- 90V 2V
B+ C- 45V 4.5V
A+ (6V)
A-
B-
C+
GND
SW
32
500K
1MF
1MF
.001
.00025
2M
Trim.
350 MMF
.006 MMF
.00025
350 MMF
.00025
1.5K
1.5K
1.5K
N/C
N/C
N/C
RFC
RFC
RFC
2.2:1
2.2:1
71A
12A
DET
200A
200
01A x3
TYPE "C" TOROSTYLE COILS x3
TYPE "A" TOROSTYLE COIL
(*) = Flip switch for long or short ANT.
B-T "COUNTERPHASE SIX" VARIANT, 1926

BREMER-TULLY A-B-C POWER UNIT



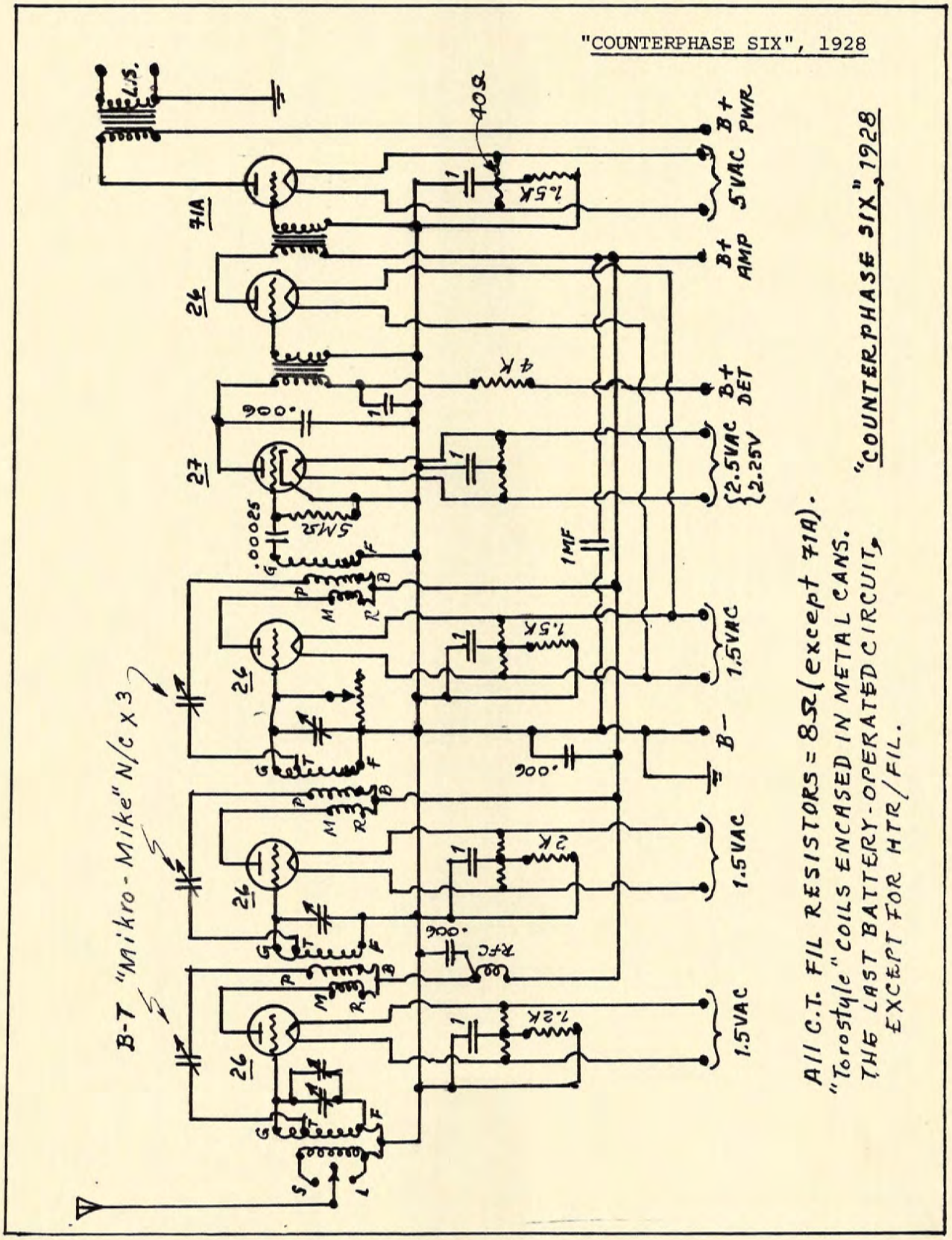
This would appear to have been the last A-B-C battery eliminator produced by B-T, 1928. Bremmer's penchent for half-wave rectifiers was still with him, as witness the 16B and 81 tube reference.

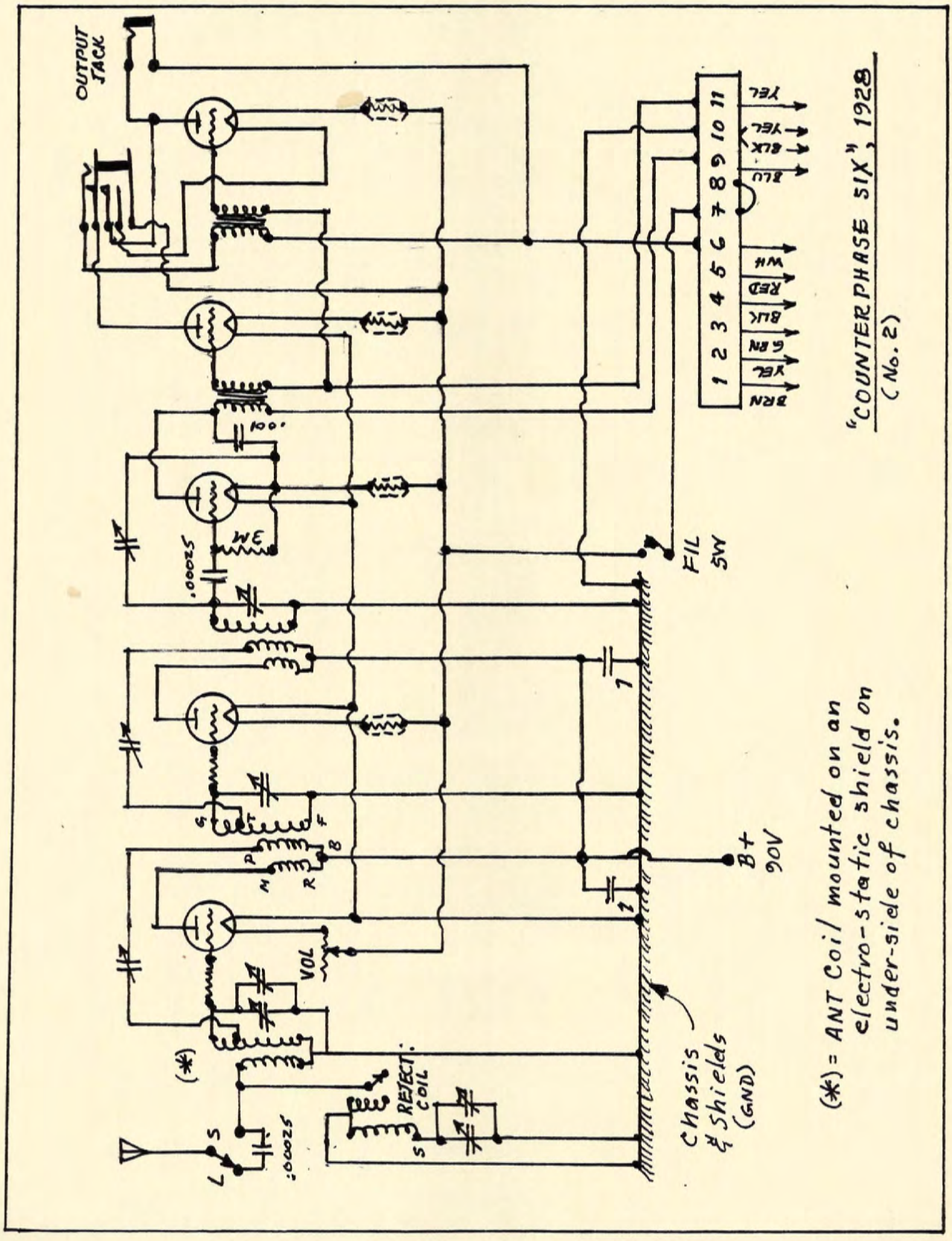
This particular unit would operate only electro-dynamic speakers that required 60mA and 75V energising coil. When a PM speaker was used, "S" and "J" were jumpered, the jumper being removed for a power speaker. When using a power speaker, the energising coils of the speaker were connected to "S" and "F". In other B-T power units, the same configuration was designated as A,B,C terminals off of the "hot" lead from the filter chokes.

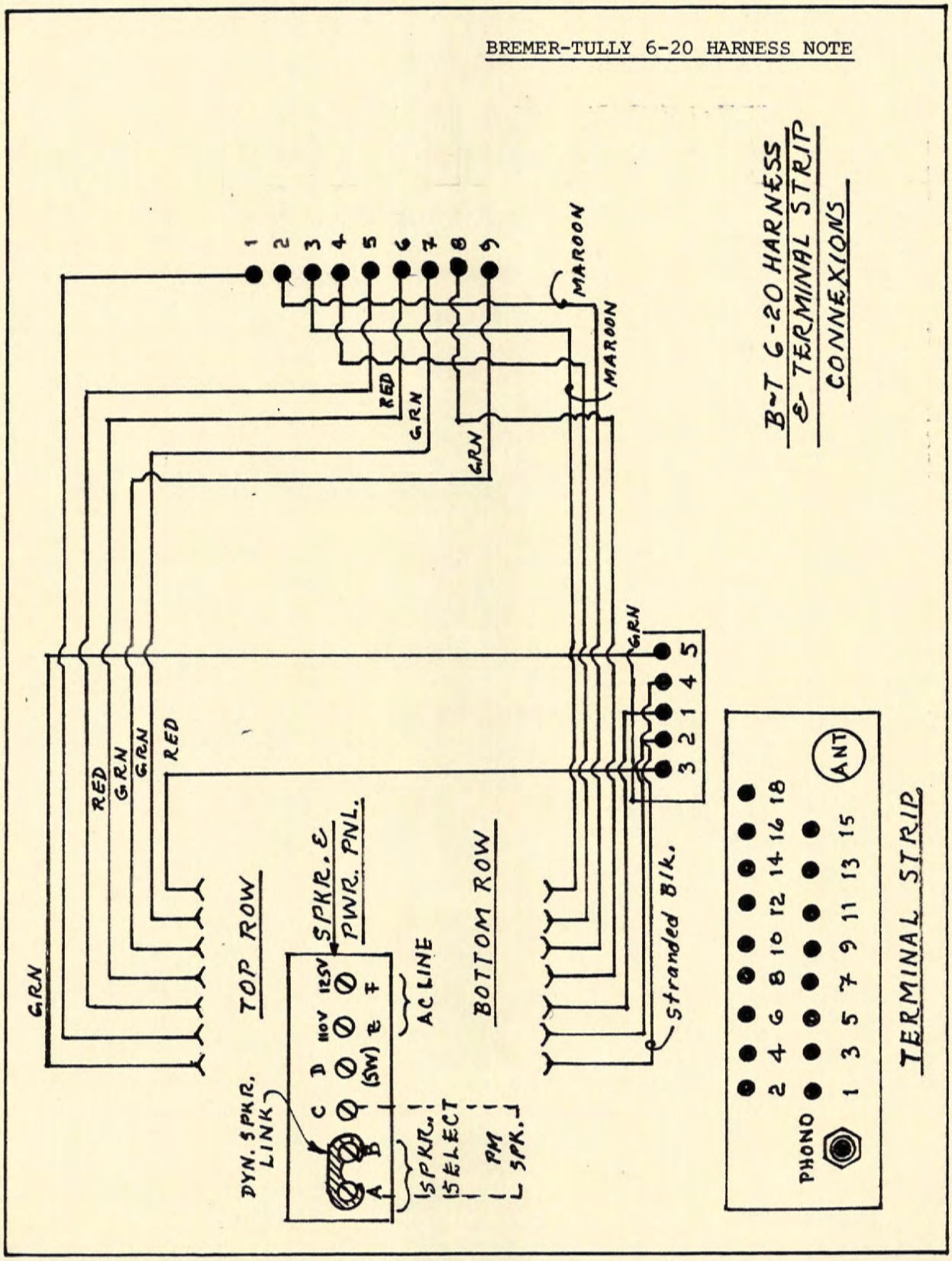
In the above Sketch the "A" cable harness supplied power to the FIL/HTR circuit. The "B" cable harness supplied plate current to the receiver. The set had a Switch Cable, with a standard AC plug on the end, which was plugged into the rear of the unit shown above.

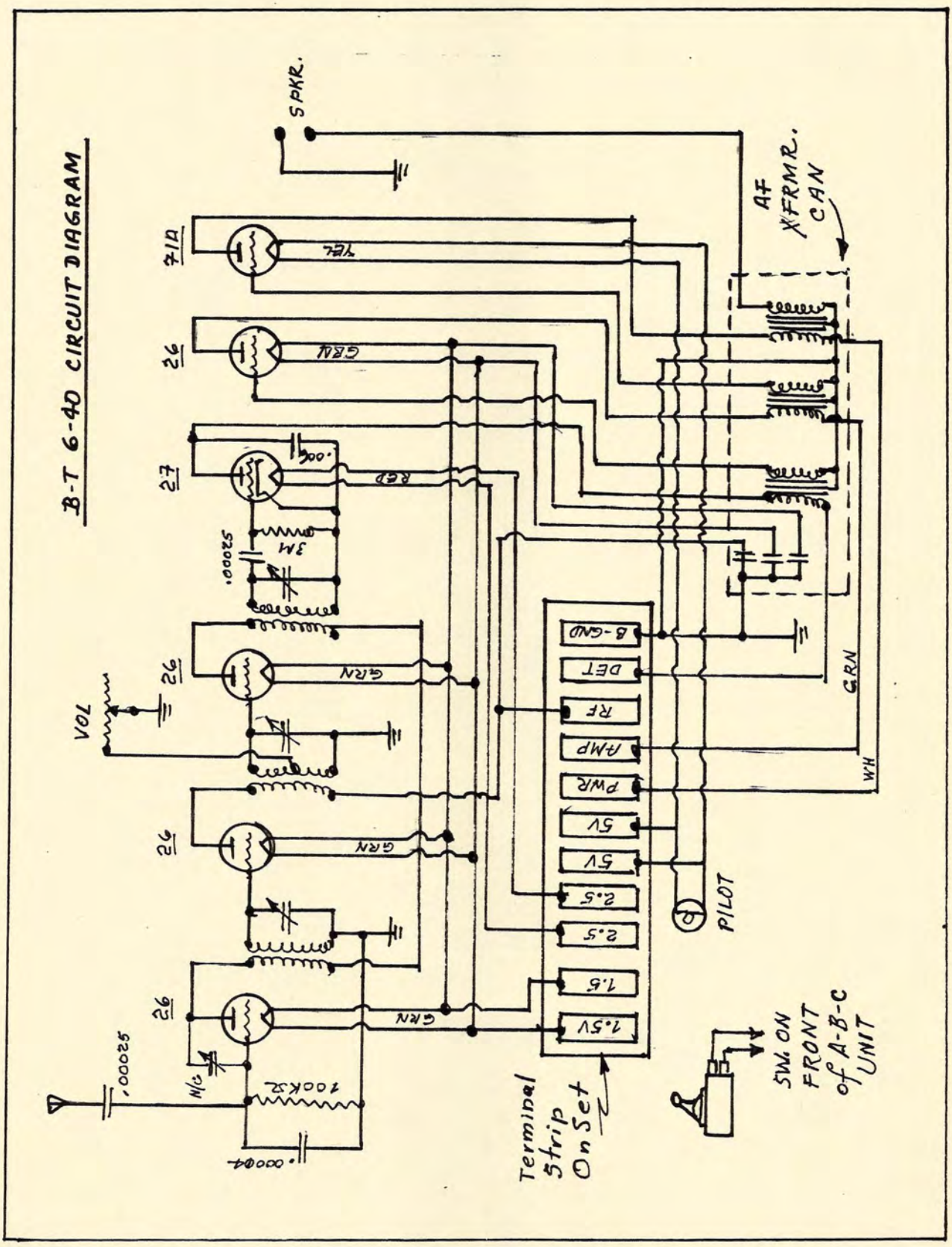
The circuit itself was similar to all other previous B-T power units.

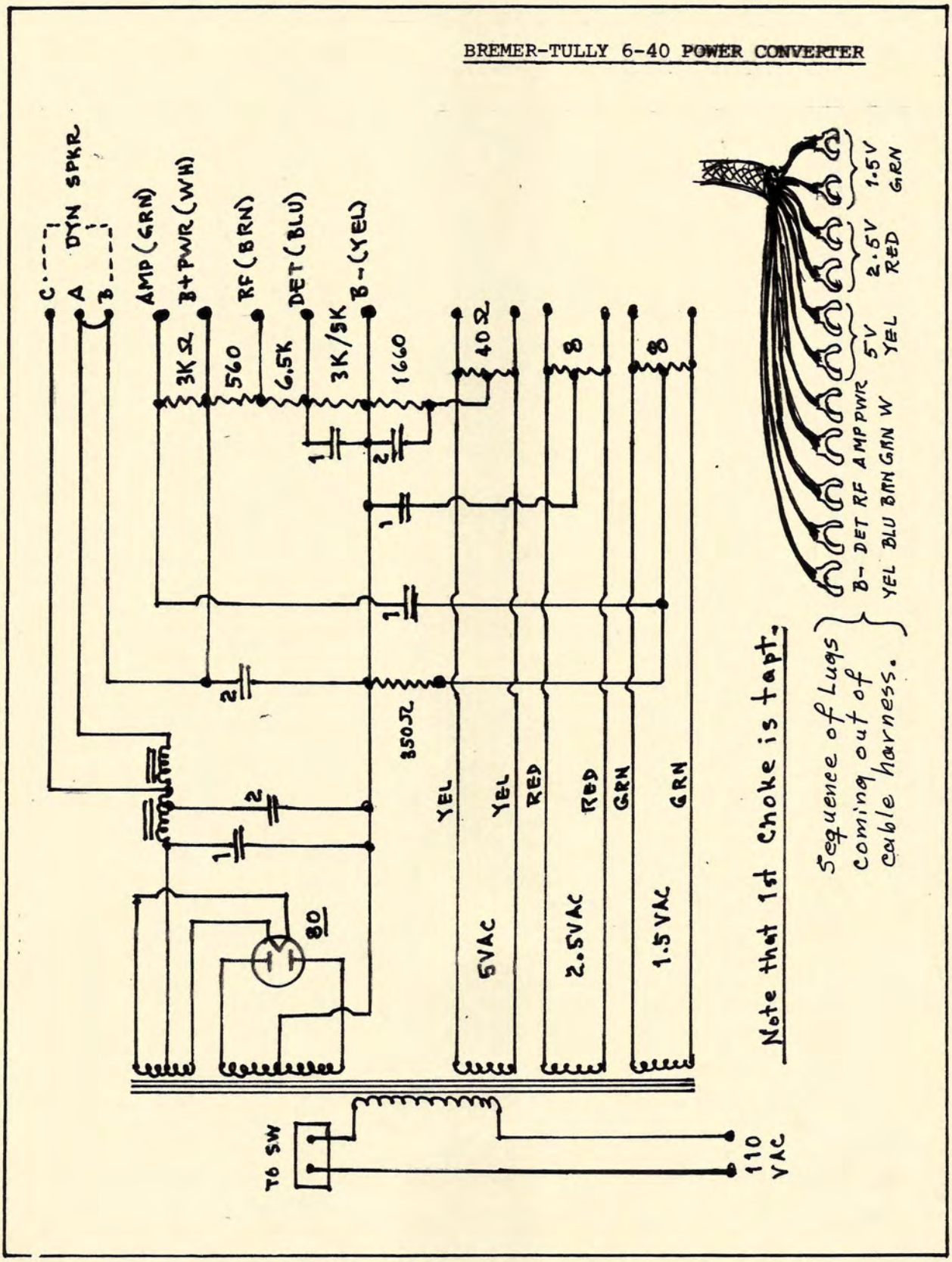
* * *
* *
*

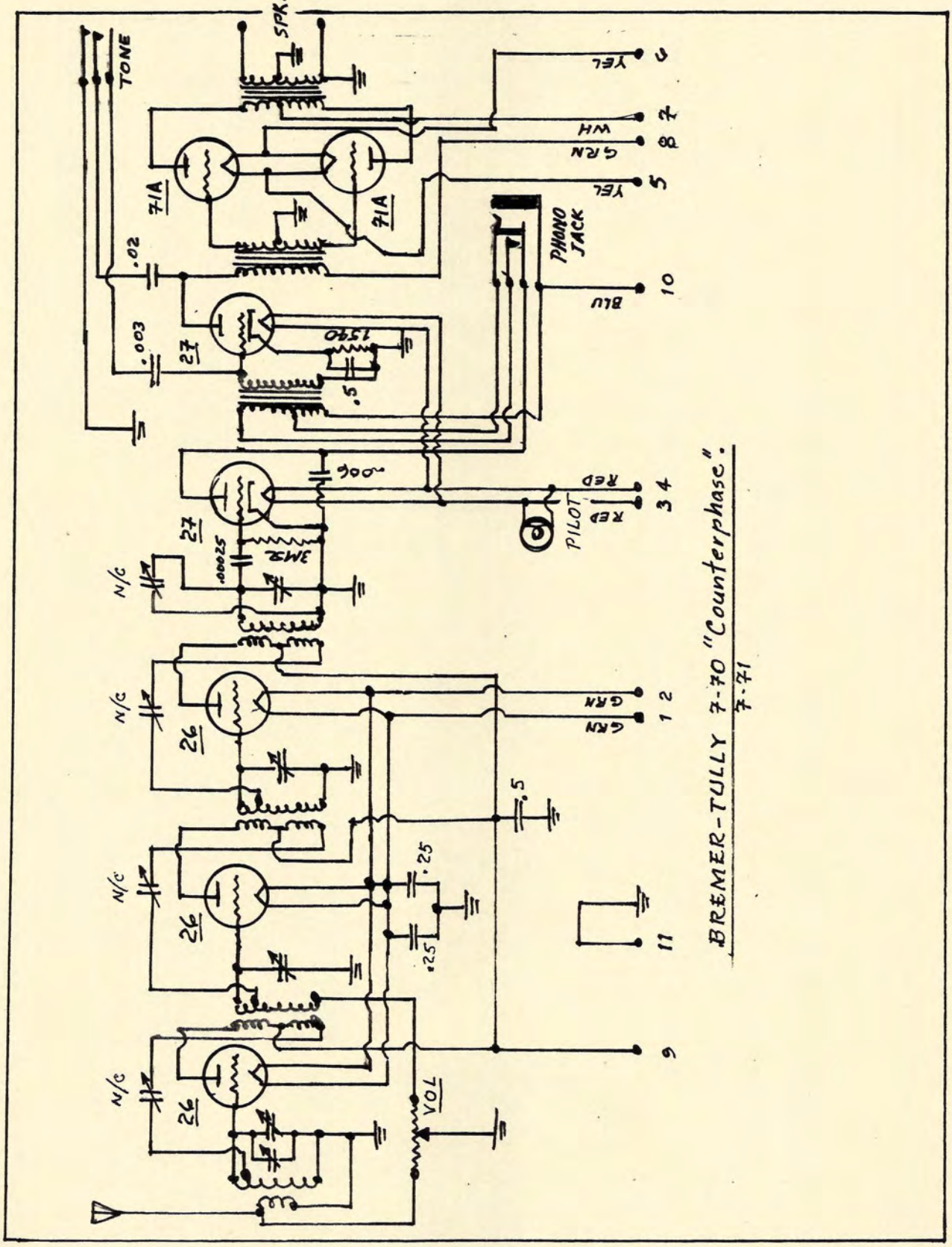

"COUNTERPHASE SIX", 1928
L.S.
40Ω
B+ PWR
5VAC
71A
B+ AMP
26
4K
B+ DET
2.5VAC
2.25V
27
.00025
SM2Ω
1MF
1.5K
1.5VAC
B-
.006
2K
1.5VAC
RFC
7.2K
1.5VAC
B-T "Mikro-Mike" N/C X 3
All C.T. FIL RESISTORS = 8Ω (except 71A).
"Torostyle" COILS ENCASED IN METAL CANS.
THE LAST BATTERY-OPERATED CIRCUIT,
EXCEPT FOR HTR/FIL.
"COUNTERPHASE SIX", 1928


OUTPUT JACK
100.
.00025
3M
VOL
REJECT. COIL
.00025
(*)
S
L
M
P
R
B
G
F
1
FIL SW
B+ 90V
Chassis & Shields (GND)
1 2 3 4 5 6 7 8 9 10 11
BRN
YEL
GRN
RED
BLK
WH
BLU
YEL
BLK
YEL
"COUNTERPHASE SIX", 1928 (No. 2)
(*) = ANT Coil mounted on an electro-static shield on under-side of chassis.

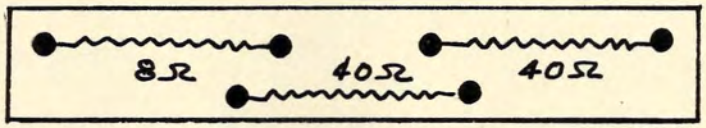

BREMER-TULLY 6-20 HARNESS NOTE
B-T 6-20 HARNESS & TERMINAL STRIP CONNEXIONS
1 2 3 4 5 6 7 8 9
MAROON
MAROON
RED
GRN
GRN
GRN
RED
GRN
GRN
RED
GRN
TOP ROW
BOTTOM ROW
SPKR. & PWR. PNL.
AC LINE
DYN. SPKR. LINK
C D 110V 125V
(SW)
A B
SPKR. SELECT
PM SPK.
3 2 1 4 5
Stranded Blk.
2 4 6 8 10 12 14 16 18
PHONO
1 3 5 7 9 11 13 15
ANT
TERMINAL STRIP


B-T 6-40 CIRCUIT DIAGRAM
SPKR.
AF XFRMR. CAN
VOL
GRN
PILOT
SW. ON FRONT of A-B-C UNIT
Terminal Strip On Set
B-GND
DET
RF
AMP
PWR
5V
5V
2.5
2.5
1.6
1.5V
100KΩ
3M

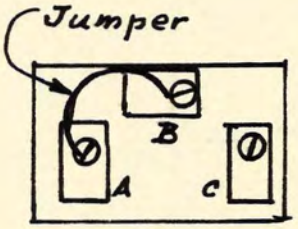

BREMER-TULLY 6-40 POWER CONVERTER
C
A DYN SPKR
B
AMP (GRN)
B+ PWR (WH)
RF (BRN)
DET (BLU)
B- (YEL)
3K Ω
560
6.5K
3K/5K
1660
40 Ω
8
8
350 Ω
80
YEL
YEL
RED
RED
GRN
GRN
5VAC
2.5VAC
1.5 VAC
TO SW
110 VAC
1.5V GRN
2.5V RED
5V YEL
B- DET RF AMP PWR
YEL BLU BRN GRN W
Sequence of Lugs coming out of cable harness.
Note that 1st Choke is tapt.


SPK.
TONE
71A
71A
.02
.003
27
1540
.5
PHONO JACK
YEL
WH
GRN
YEL
BLU
RED
RED
PILOT
.005
27
3MΩ
.00025
N/C
26
26
26
.5
.25
.25
VOL
5
8
7
10
3
4
1
2
11
9
BREMER-TULLY 7-70 "Counterphase."
7-71

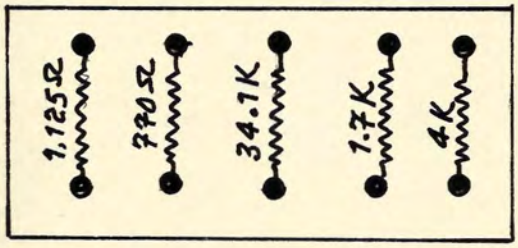
B-T 7-70/7-71 DETAILS



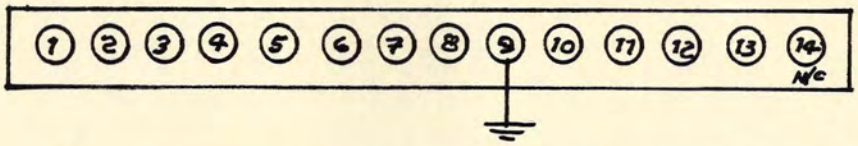
BIAS RESISTORS



FIELD COIL CONNECTOR

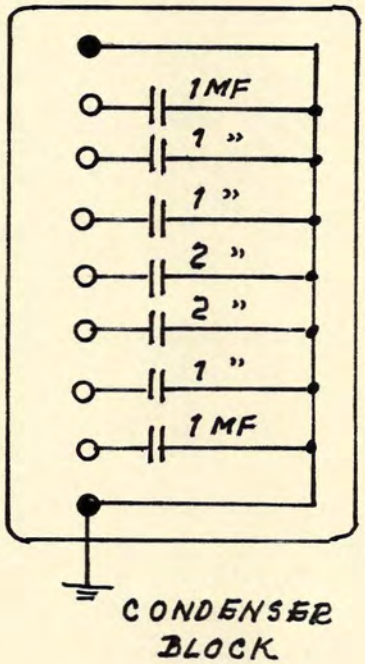


RESISTANCE NETWORK

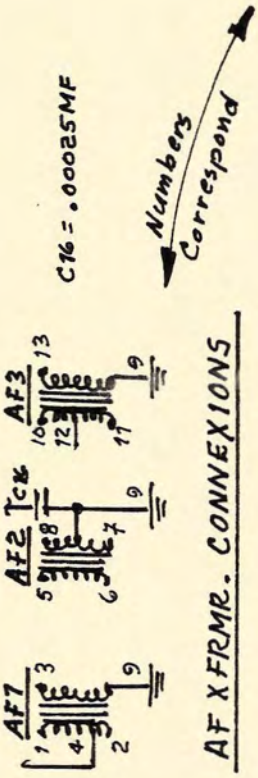


CONNEXIONS IN AF XFRMR. SHIELD CAN

Contains all 3 AF Xfrmrs. plus .01 condenser (marked C16 on L.H sketch of xfrmrs.).



CONDENSER BLOCK



AF XFRMR. CONNEXIONS

B-T 7-70/7-71 NOTATIONS

"COUNTERPHASE" NEUTRALISING METHOD

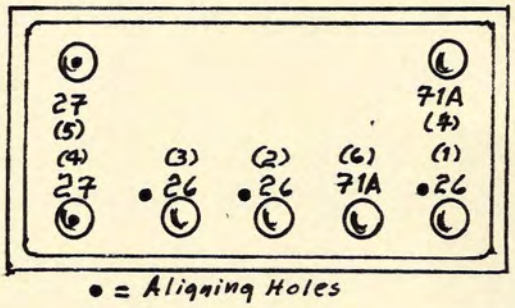
Required: One good 26 tube with one FIL prong removed;
One insulated alignment tool.

1. Tune in a loud signal, adjusting all controls for exact resonance.
2. Remove 26 tube (#3 on tube layout sketch) and replace with the special 26 tube.
3. Retune all controls for loudest signal.
4. With the insulated aligning tool, trim the Mikro-Mike neutralising condenser adjacent to the tube until you find the mid-point between loudest signal and no signal at all.
5. Leave Mikro-Mike condenser at that setting.
6. Replace original tube and repeat Steps 2 through 5 for the other two 26 tubes.
7. Radio is now adjusted for all stages.

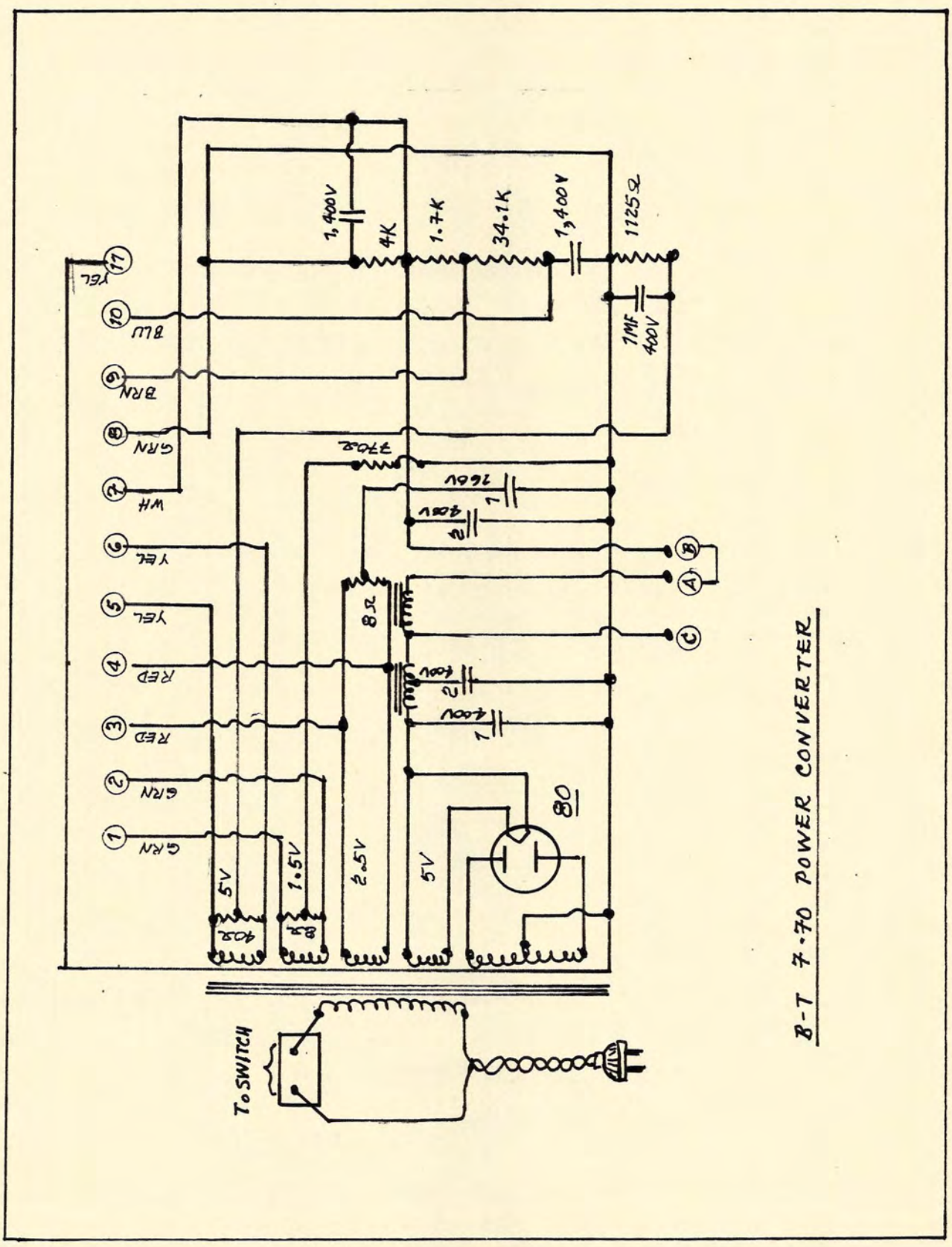
NOTE: This procedure is applicable to all of the latter-day "Counterphase" receivers, although some additional steps are required with some models, which are detailed herein after.

TYPICAL VOLTAGE READINGS

	Tube	FIL	B+	C-	Plate mA	Grid Test mA
1.	26	1.4	150	9	5	12
2.	26	1.4	150	9	5	12
3.	26	1.4	150	9	5	12
4.	27	2.1	60	-	2	2
5.	27	2.1	150	8	5	8
6.	71A	4.9	150	30	18	41
7.	71A	4.9	150	30	18	41

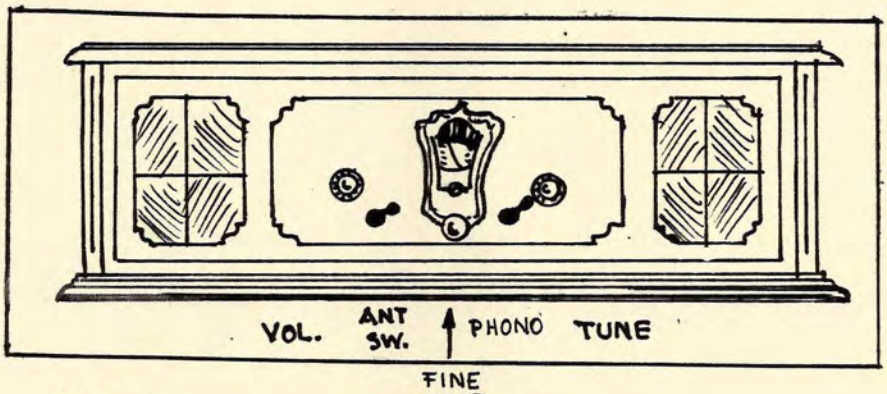


TUBE LAYOUT 7-70/7-71



B-T 7-70 POWER CONVERTER

BREMER-TULLY 8-20 SERIES, 1929
(Sht. 1)

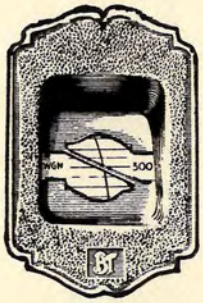


(1928)

B-T "COUNTERPHASE" REFERENCES IN EARLY MEDIA:

Radio Digest, November & December, 1925.
Radio Broadcast, January & February, 1926.
Radio Engineering, January & February, 1926.
On-The-Air, December, 1926.
Popular Mechanics, February, 1926.
Radio Informer, January, 1926.
Radio News, November, 1926.
Radio International, March, 1926.
Citizens' Call Book, Spring, 1926.
Radio Review & Listeners' Guide, Spring, 1926.
Citizens' Call Book, Fall, 1924.
The Radio Home, May, 1926.
Citizens' Call Book, No. 3, 1926.
Popular Radio, March, 1926.
Amateurs' Handibook, Vol. 2, 1926.
Radio-Craft, January, 1930.
On-The-Air, January, 1927.
Radio Digest, Novemder, 1926.
Radio News, January, 1927.
Popular Mechanics, January, 1927.
Citizens' Call Book, December, 1926.
Radio Informer, January, 1927.
Radio Broadcast, January, 1927.
Radio Review & Listeners' Guide, January, 1927.

THE "COUNTERPHASE" STATION INDICATORS



The latter-day "Counterphases" incorporated a Station Indicator that was unique enough to be granted in patent in September 1926, although it was not used until B-T went into the manufacture of their own sets in 1928.

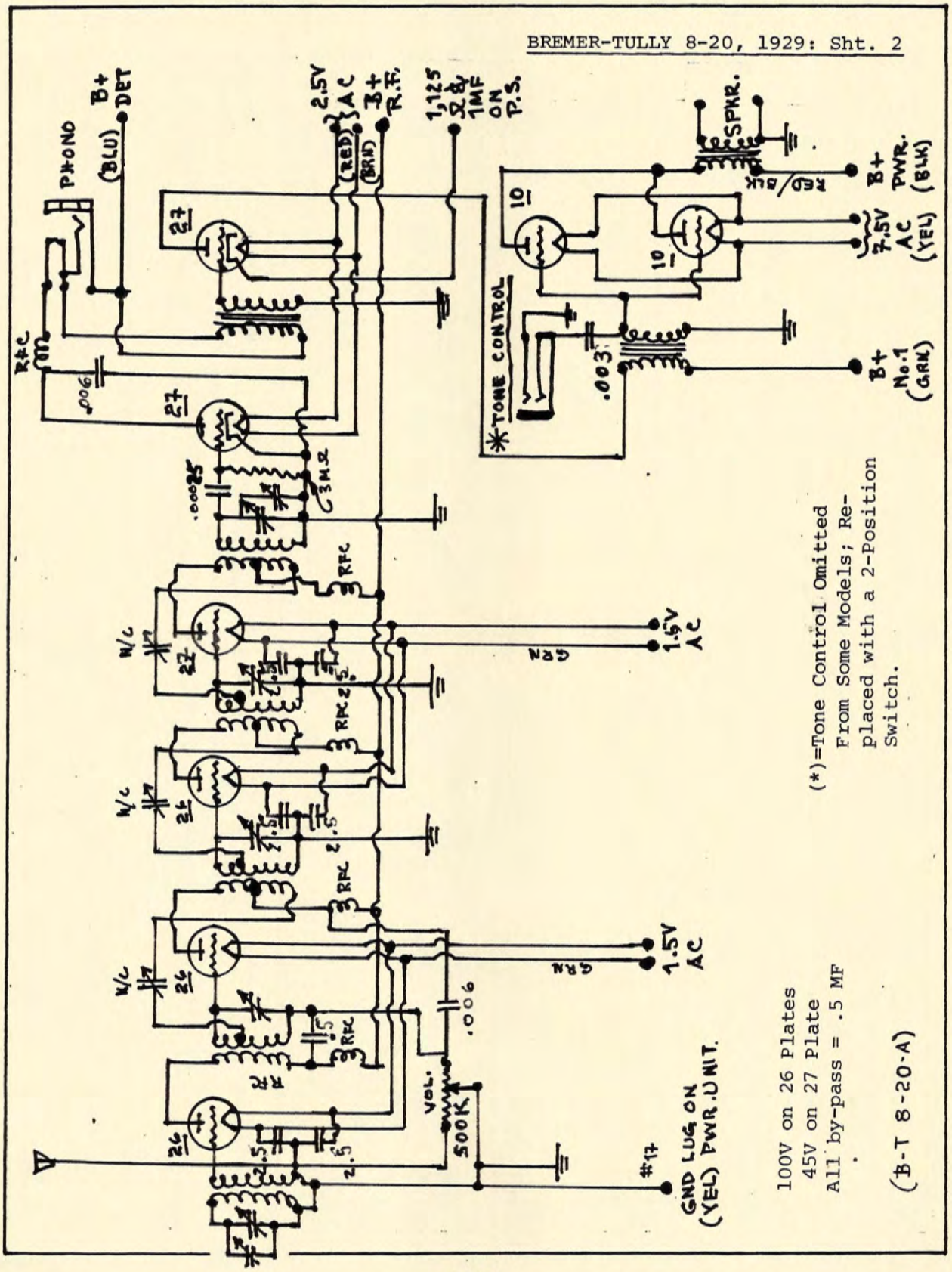
The marking on the dial indicated wavelength at right and the frequency at left, both by numerals. There was a red line running for the full length of the dial, that seemed to waver from one end to the other - which was the way it was supposed to be. The wavelength indication was exact when the calibration line (the red line) met the upper edge of the diagonal cross-bar.

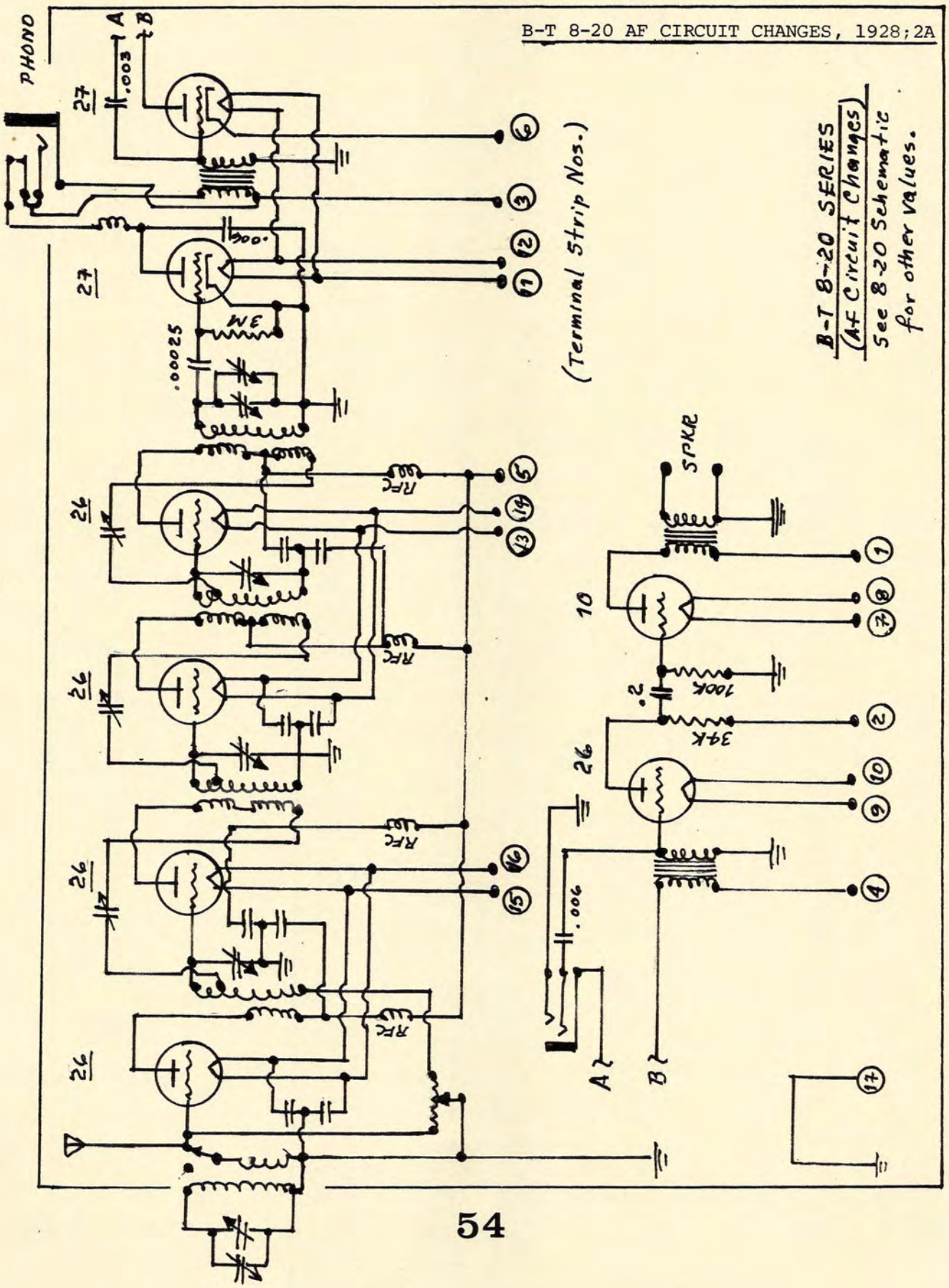
The heavy lines are 10 meters apart; the light lines are five meters apart. The indicator tape (dial) is held in position by an adjusting screw at one end, and by a spring at the other. The position of the dial in respect to the wheel (drum) may be changed rapidly.

If it becomes necessary to readjust the dial tape, proceed as follows:

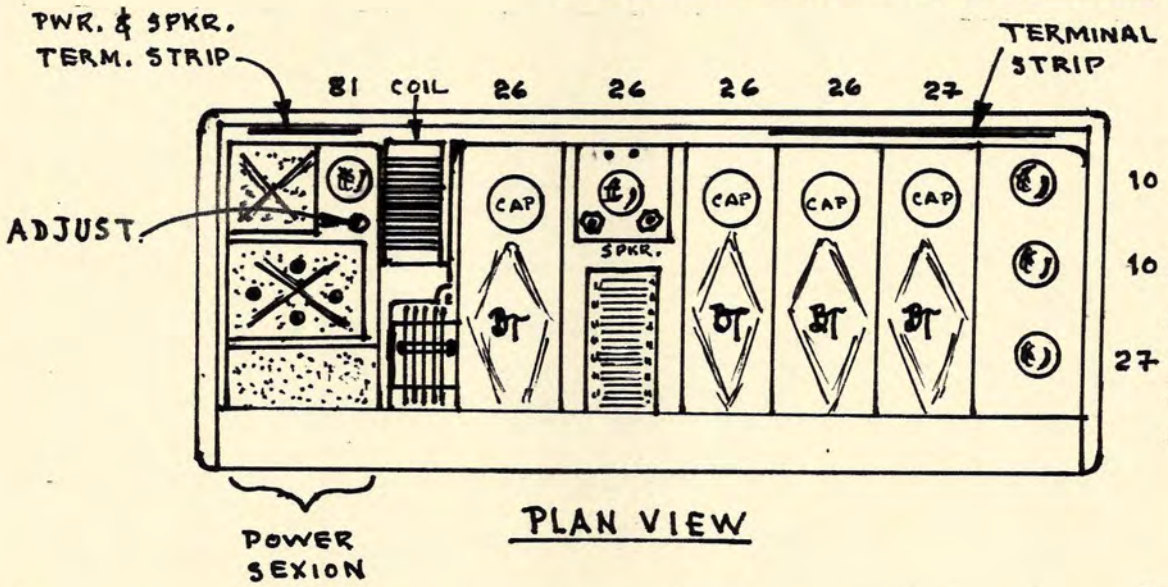
1. Tune receiver to a station between 350 and 400 meters.
2. Select an accurately broadcasting station.
3. Reduce volume and FINE TUNE for sharpest signal.
4. Loosen the dial tape adjusting screw on the indicator metal wheel and adjust dial tape carefully until the indicator reads the exact wavelength of the broadcasting station.
5. Tighten the adjusting screw with a lock-nut.

* * *
* *
*


BREMER-TULLY 8-20, 1929: Sht. 2
PHONO
B+ DET (BLU)
2.5V AC (RED)
B+ R.F. (BRN)
1,125 Ω 1MF ON P.S.
SPKR.
B+ PWR. (BLK)
7.5V AC (YEL)
B+ No.1 (GRN)
TONE CONTROL
R&C
.006
.0035
.003
RFC
1.5V AC
VOL. 500K
.0006
#17 GND LUG ON (YEL) PWR.UNIT.
(*)=Tone Control Omitted From Some Models; Replaced with a 2-Position Switch.
100V on 26 Plates
45V on 27 Plate
All by-pass = .5 MF
(B-T 8-20-A)


B-T 8-20 AF CIRCUIT CHANGES, 1928; 2A
B-T 8-20 SERIES
(AF Circuit Changes)
See 8-20 Schematic
for other values.
(Terminal Strip Nos.)
PHONO
SPKR
RFC
A
B

BREMER-TULLY 8-20/8-20A, 1929; Sht. 3



PLAN VIEW

WIRE COLOUR-CODE

1. Green, 26 FIL.
2. Green, 26 FIL.

3. Red, 27 FIL.
4. Red, 27 FIL.

5. Yellow, 10 FIL.
6. Yellow, 10 FIL.

7. Green, B+ No. 1.
8. Brown, B+ RFCs & 1st AF.
9. Blue, B+ DET.
10. Yellow, B-, Chassis, GND.
11. Black, AC line.

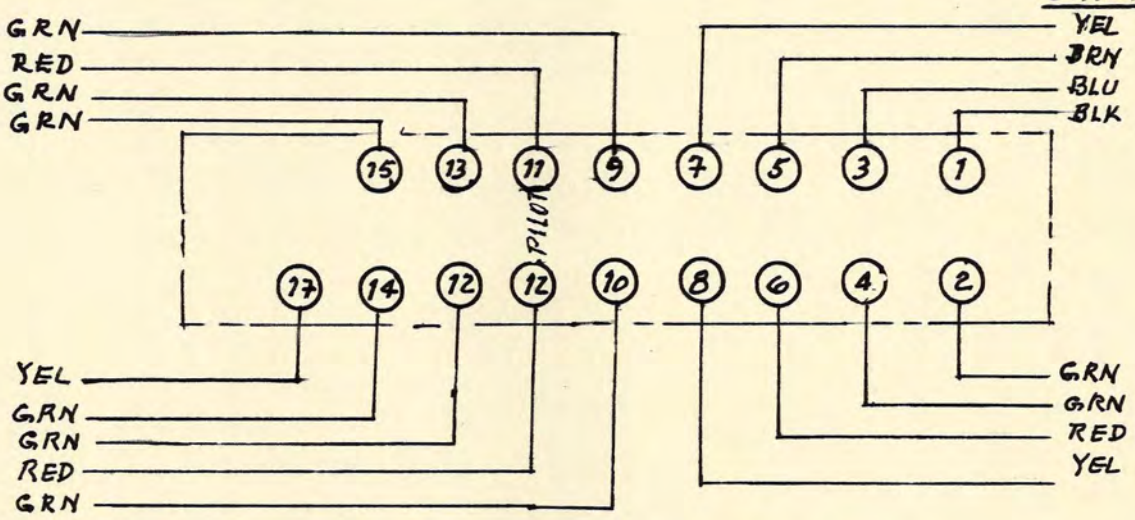
TYPICAL VOLTAGES

	A	B	C	PL/mA	
26	1.4	150	9	5	
27	2.1	60	2/0	2	DET
	2.2	130	7	5	1st AF
10	7.2	240	23	20	
	7.5	350	18	20	

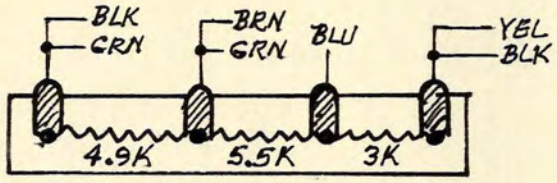
NOTE:

There was a recurring problem with the 8-20 - a residual AC hum induced by an unbalanced shunt resistor. These resistors, as was the fashion, were tapt at their physical centre, not their electrical centre. The problem was resolved by service-men of the time by the installation of a variable center-tapt resistor, on the order of 2M-ohms. My own 8-20 had that problem, and the problem was resolved with the above solution. Keep it in mind, as it would also apply to other sets using 27s.

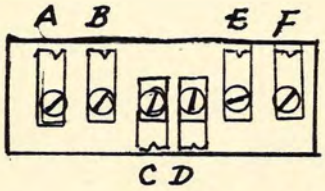
Sht. 4



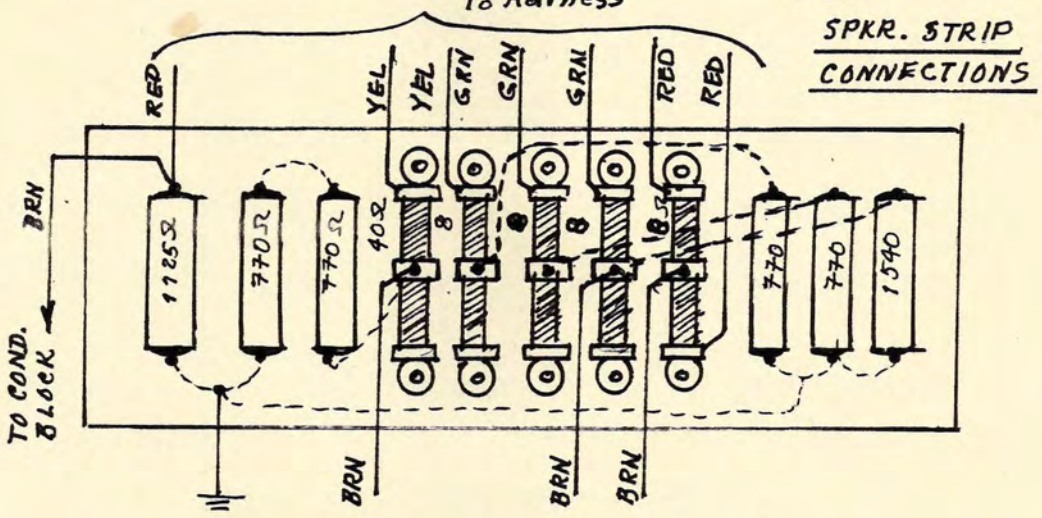
TERMINAL STRIP ON SET



VOLTAGE DIVIDER



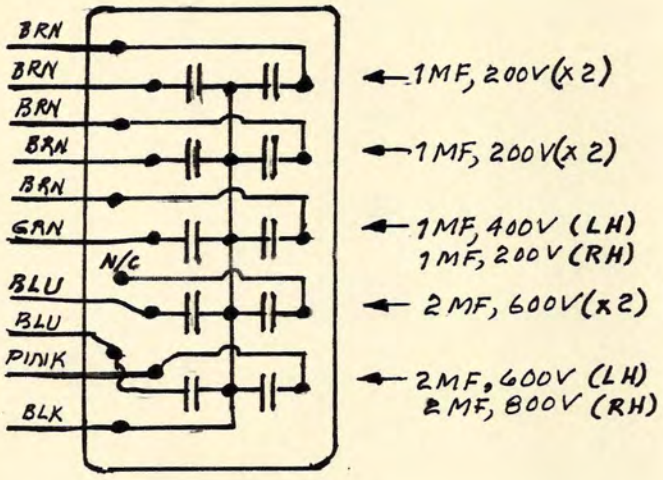
SPKR. STRIP CONNECTIONS



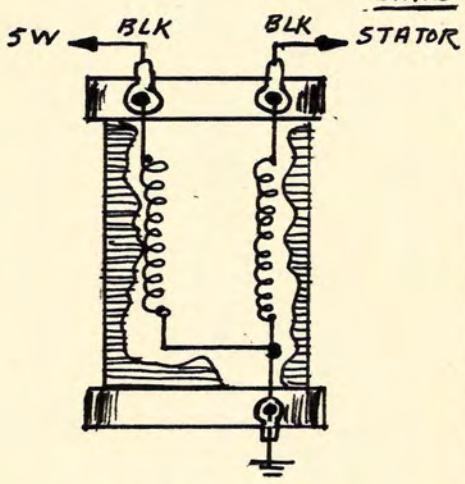
RESISTOR MOUNTING BOARD
(Partial Wiring Shown)

B-T 8-20 SERIES

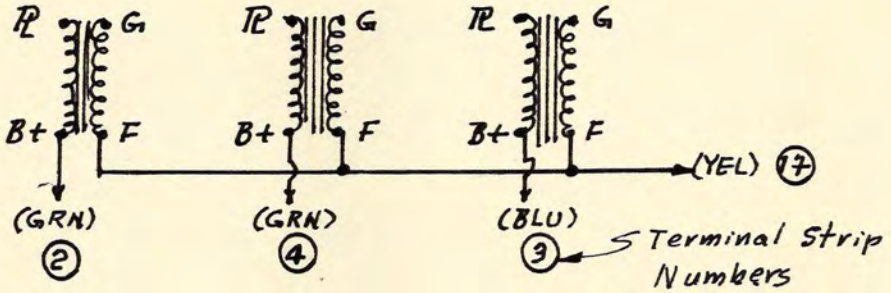
Sht.5



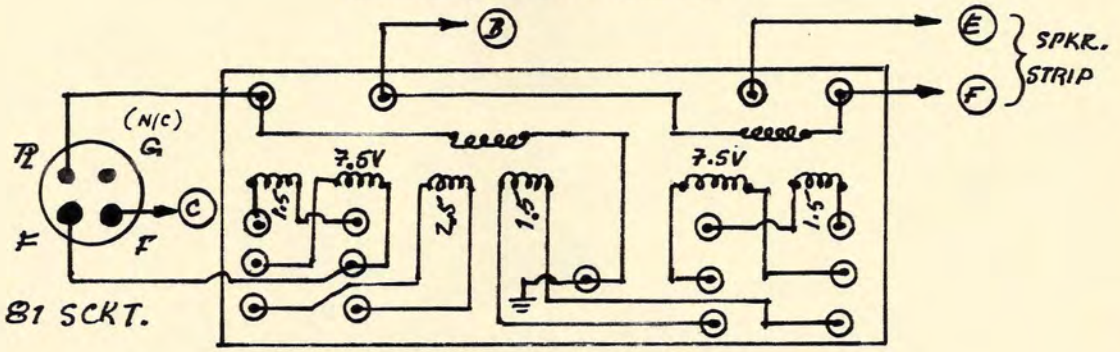
CONDENSER BLOCK



REJECTOR COIL DETAIL

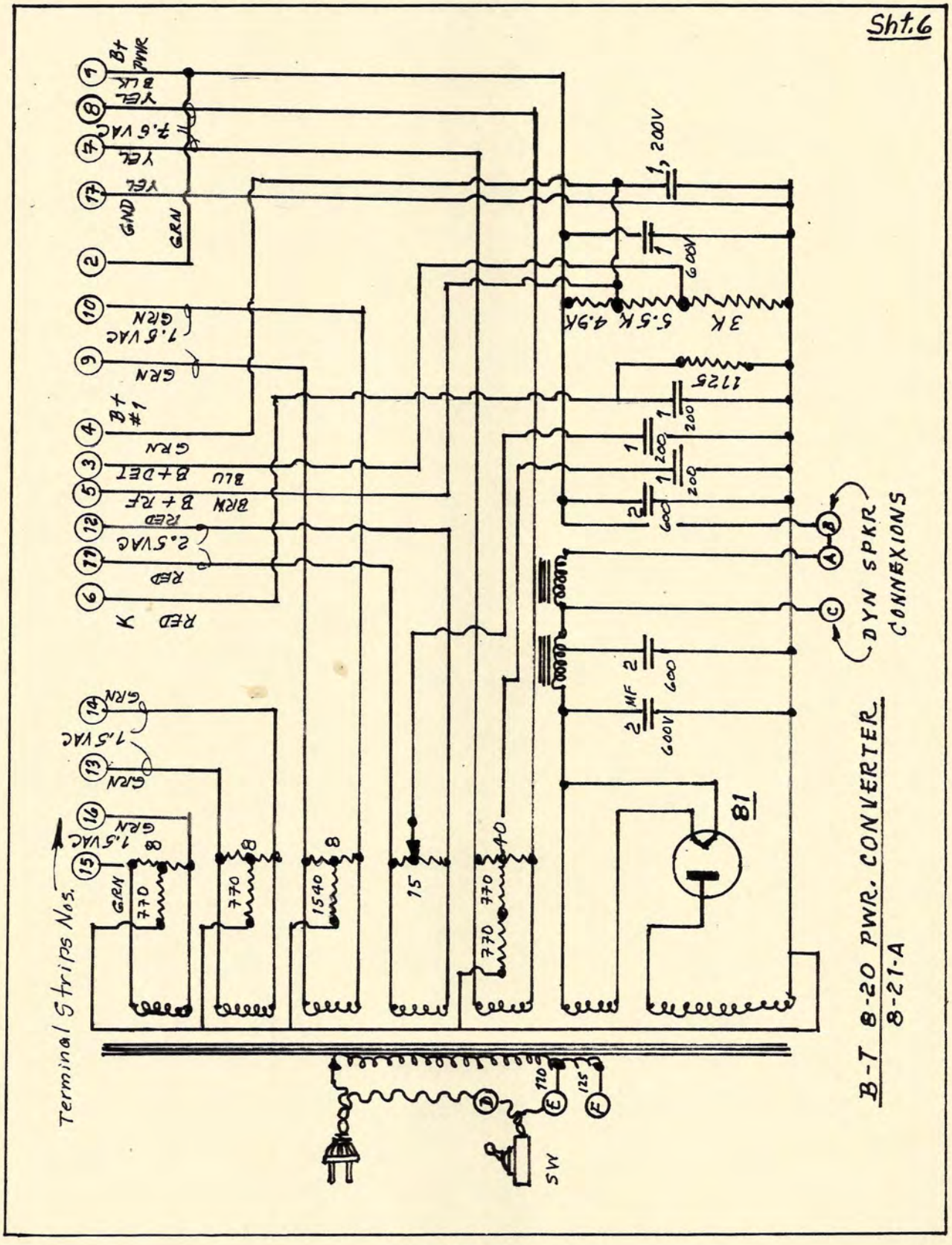


AF XFRMR. LEADS

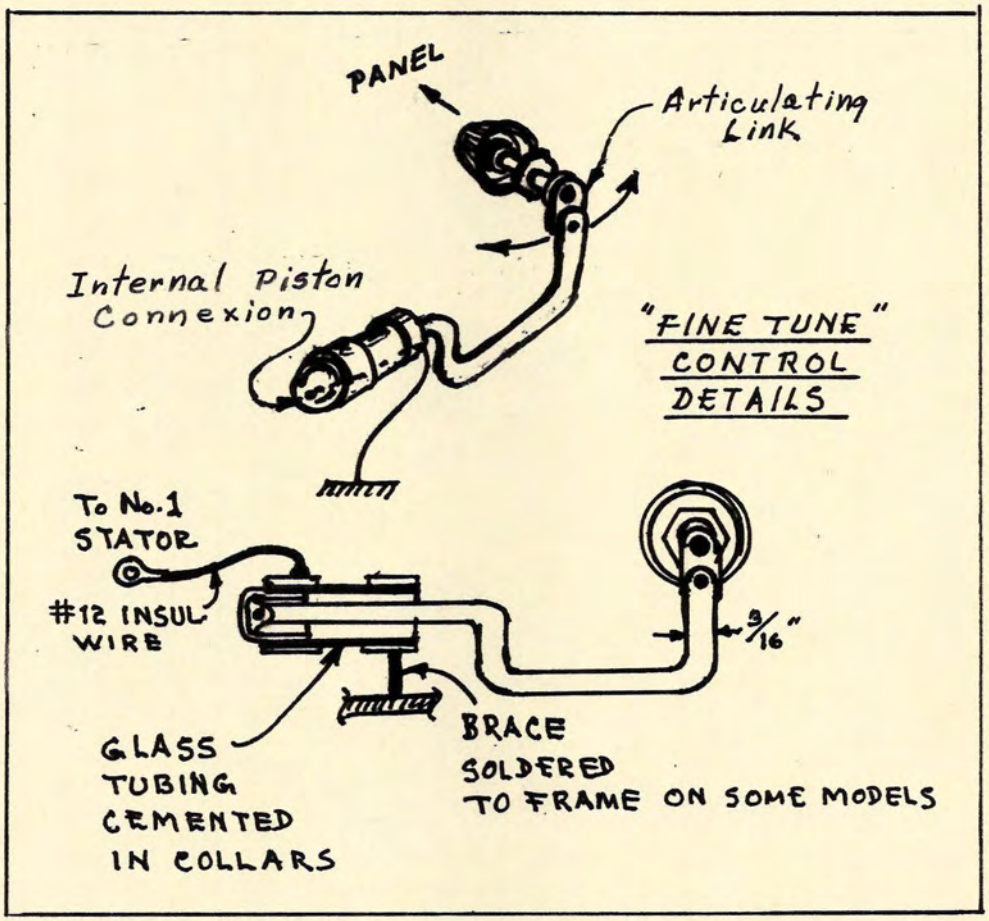


AC POWER XFRMR. CONNEXIONS

B-T 8-20 SERIES

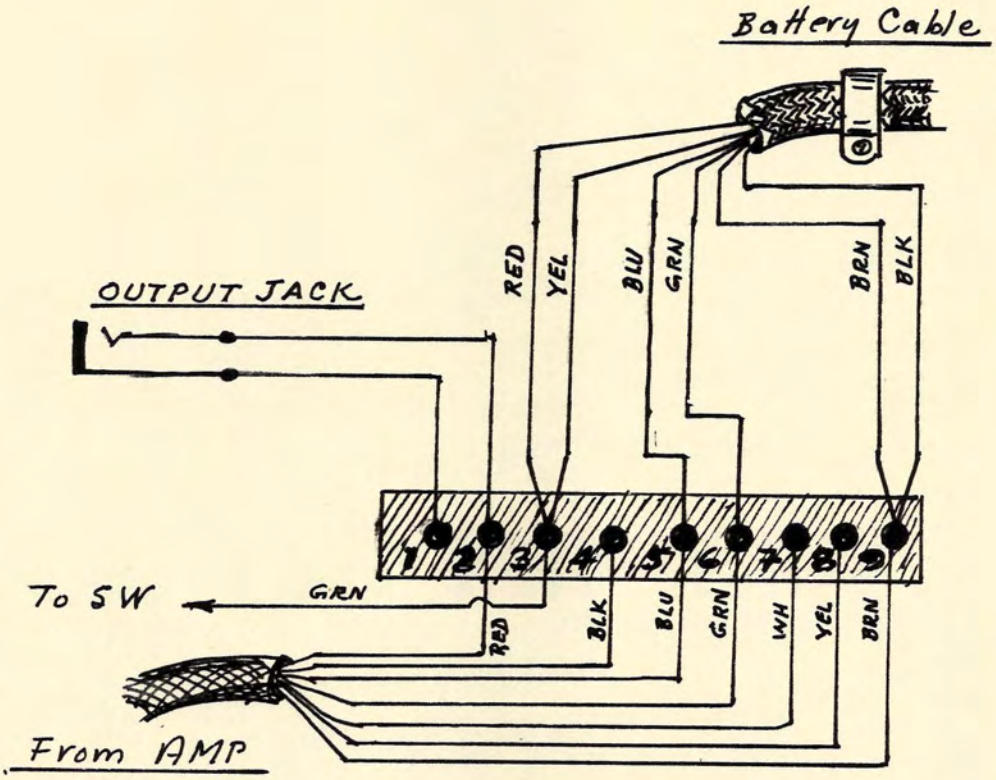

Sht.6
B-T 8-20 PWR. CONVERTER
8-21-A
DYN SPKR CONNEXIONS
81
Terminal Strips Nos.
RED
GRN
BLU
BRK
B+ PWR
YEL
GND
B+ #1
B+ DET
B+ RF
2.5 VAC
7.5 VAC
7.6 VAC
1,200V
600V
SW

BREMER-TULLY 8-20 NOTATIONS (Sht 7)



VOLTAGE DATA - 115VAC						
Tube	Role	A	B	C	PL. mA	PL.mA/Grid
26	1st RF	1.4	150	10	5	10
26	ANT	1.4	150	10	5	10
26	2nd RF	1.4	150	10	5	10
26	3rd RF	1.4	150	10	5	10
27	DET	2.2	60	0	2	—
27	1st AF	2.2	130	7	5	10
10	2nd AF	7.5	350	18	20	50
10	2nd AF	7.5	350	18	20	50

B-T "COUNTERPHASE 8"; Sht. 8



AMPLIFIER & BATTERY CABLE WIRING

(Refer to B-T 6-20 Harness Note, Page 41, Which Is Also Applicable to the 8-20 Series.)

SERVICE DATA

The following data are applicable to all latter-day "Counterphase" sets. The AF stages in both series were of standard transformer coupled configuration, and can easily be tested in the usual way with no problems.

All sets were adjusted at the factory at 90V potential in the B+ 90V circuit, and it remains imperative that this potential be held fairly close in service. Voltmeters should be of the very high resistance type, not drawing in excess of 1 mA to 1.5 mA at full voltage.

THE 200A DETECTOR TUBE:

While other type tubes than the 200A may be used successfully in the "Counterphase", you should try to find a good 200A, just to see what the circuit did as originally designed. It had sensitivity far in excess of the 01A. However, because of this sensitivity a peculiarity was early on noted - namely, that the tube hissed after the set was turned on. This disturbed a lot of early set owners, but the hissing will disappear when a signal is tuned in.

AUDIO STAGE OSCILLATION:

Even in the latter-day "Counterphases", the original Bremer-Tully AF transformers were used with their odd 2.2:1 ratio. Oscillation was obviated by the 100K-ohm resistor shunted across the Secundary of the transformer. Should oscillation occur, however, it may be overcome by decreasing the value of these shunts (there are three in each set). If you have the original B-T shunts intact and seem to be holding their original values, a pencil mark across the resistors from metal end to metal end will usually do the trick. Otherwise you can always install a variable resistance, unless you're a purist.

IF THE SET OSCILLATES:

If the set oscillates - and it shouldn't - it will be due to one of the following causes:

1. Too high a voltage is being applied to the B+90V circuit. If the voltage is only slightly above 90V, then oscilla-

tion will occur over a small band around 300 meters.

2. If the set still oscillates when supplied with a known potential of 90V (always test the 90V B+ circuit with fully charged BATTERIES! - not a B-eliminator), it may be stopt by adjusting the "Mikro-Mikes as follows:

   a) Tune in a signal around 300 meters.
   b) Turn REJECTOR off.
   c) Adjust tuning control while reducing the volume to the point that obtains shrp tuning on the FINE TUNE knob.
   d) DO NOT ADJUST "MIKRO-MIKE" IN THE DET STAGE!
   e) Adjust all three RF "Mikro-Mikes" one-half turn counter clockwise at a time, then tune station carefully at each adjustment.
   f) If oscillation persists, repeat the adjustments a half turn at a time until oscillation stops.

DETECTOR "MIKRO-MIKE" ADJUSTMENT:

This condenser is used only for the purpose of bringing into resonance with the RF stages, the DET stage. The normal setting is an almost full clockwise position. Should it become necessary to adjust this condenser, proceed as follows:

1. Tune in a signal and reduce volume until signal is sharp.
2. Adjust DET "Mikro-Mike" for loudest signal.
3. Leave the "Mikro-Mike" at that setting.

ON "COUNTERPHASE" NEUTRALISATION

Only in cases where the set has been tampered with, or thrown entirely out of adjustment should complete re-adjustment be attempted by a competent service-man.

1. Make certain the DET "Mikro-Mike" is at its extreme clockwise position.
2. Conect the ANT to the "Short Ant" post.
3. Tune in a local station.
4. Turn the REJECTOR off.
5. Remove the 3rd stage RF tube and replace it with one that is no good, such as an 01A.
6. With an insulated alignment tool, adjust the 3rd RF stage "Mikro-Mike" for weakest volume, retuning the set as the adjustment progresses.
7. The point at which the signal disappears is the right adjustment for the "Mikro-Mike".
8. Replace the removed tube, and insert the burnt-out tube into the 2nd RF stage socket.

9. Repeat steps 1 through 7 for the 2nd RF stage.
10. Repeat Steps 1 through 8 for the 1st RF stage.

If the set lacks sensitivity after these adjustment, re-adjust all RF "Mikro-Mikes" by half turns, as detailed in the following paragraphs. If the volume increases as the "Mikro-Mikes" are adjusted, it indicates that the adjustment is being made in the wrong direction.

IF SET LACKS SENSITIVITY:

Lack of sensitivity is usually due to too low voltage applied to the B+90V circuit. It may also be due to a change in the adjustment of the "Mikro-Mikes". If the latter, proceed as follows:

1. Tune in a station.
2. Adjst DET "Mikro-Mike" for loudest signal.
3. Retune for a signal between 300 and 350 meters.
4. Adjsut RF stages "Mikro-Mikes, and retune.
5. Continue readjustments until set operates satisfactorily.

ON SELECTIVITY:

The "Counterphase" sets d not have either an oscillation, or a regeneration control. The apparent selectivity of the set decreases rapidly as volume is increased, although the actual selectivity will remain practically the same.

Always tune in a signal at the loudest "readable" volume. For maximum selectivity, always operate the set with full AF power, using a decrease in RF volume for control.

THE PROBLEM OF NOISE:

If "hash" is a persistent problem, disconnect the ANT. If the noise is still there, the problem lies within the set, and may be indicated by weak or defective batteries, loose connexions between batteries and set, or pick-up from a poor GND connexion.

If the chassis has been removed from its cabinet, first check all wires which cross over between stages for possible breaks in the insulation from the bottom of the shield plate.

Check the bare copper shielded cable from the DET plate to a point near the power switch for a short or a break.

RF stages mau be checked by removing the ANT and injecting or feeding a signal directly into each stage by touching the ANT wire to to the copper wire of the RF transformer inside the shield can.

If ANT in the normal position - i.e., on Long or Short post - and volume is low, but increases when ANT is touched to the 1st RF it indicates a break between the two points.

Remove, then replace each tube in turn. If volume is not altered at any stage, it indicates that stage is defective.

Using MEDIUM power tap the DET tube. A response should carry through the speaker. Move the switch to HIGH power, and volume should increase. If not, suspect the AF stages.

If signal stops and starts, suspect the Grid-Leak.

When the REJECTOR is turned in or out, the volume should move down at the IN position; up at the OUT position even when the REJECTOR is carefully tuned to keep the volume at the right level.

TROUBLE-SHOOTING THE "COUNTERPHASE":

Trouble-shooting the "Counterphase" is fairly conventional to require detailed procedures. The chief causes of troubles, other than those already listed, lie with weak batteries, defective or shorting to set; defective tubes, rheostats, speaker; broken connexions at the tube sockets, switches, jacks; shorted or open 2-ohm resistor, choke, transformer, rejector coil; C-battery dead or connected backward; improper bias on power tube; RF or AF stages oscillating; a microphonic tube; or trimmers out of order.

Procedures for checking-out all of the above troubles are too well-known to be itemised here, as well as being readily available in far too many so-called Radio text-books.

* * *
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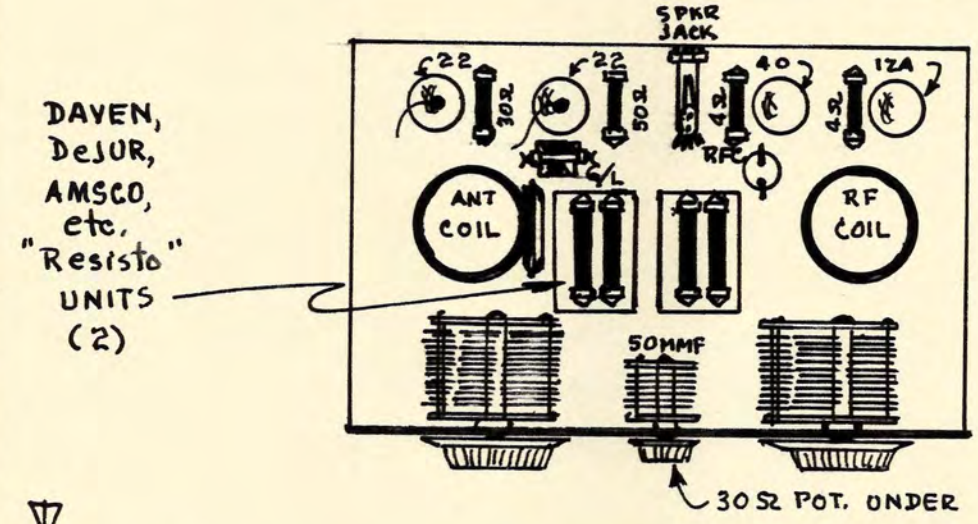
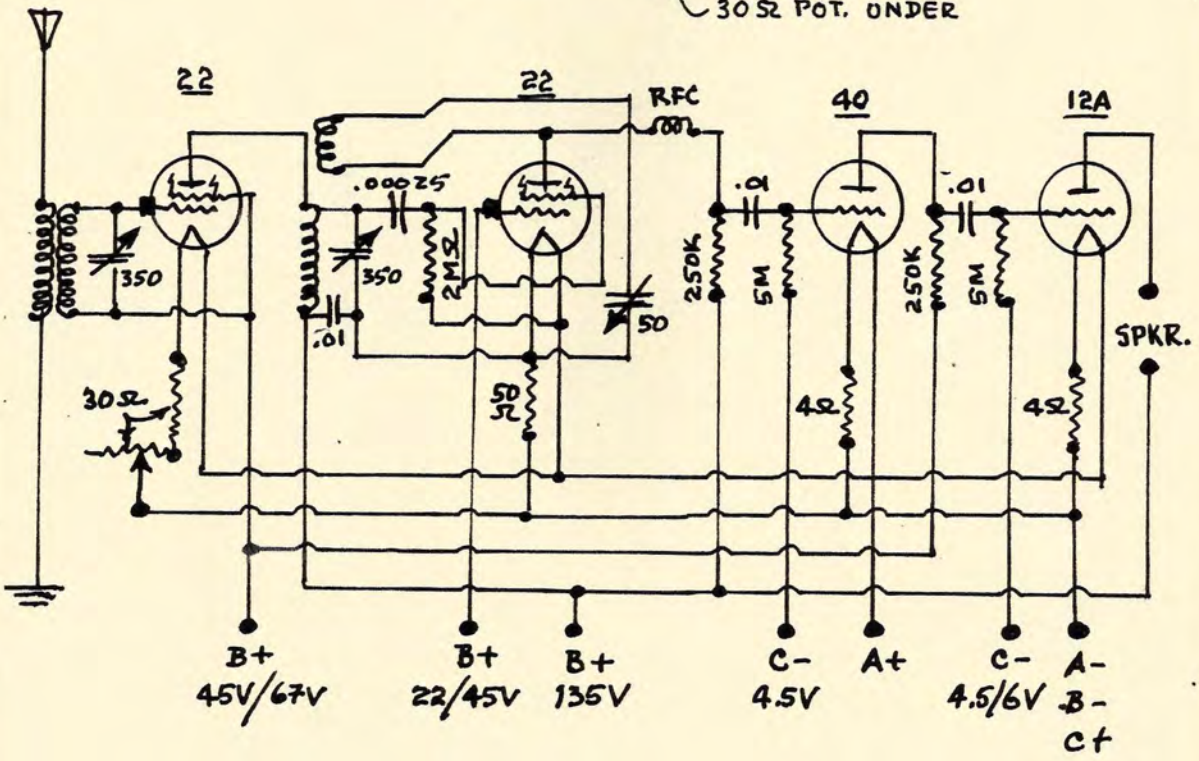
*

TULLY 4-TUBE DX-er, 1930



DAVEN, DeJUR, AMSCO, etc. "Resisto" UNITS (2)

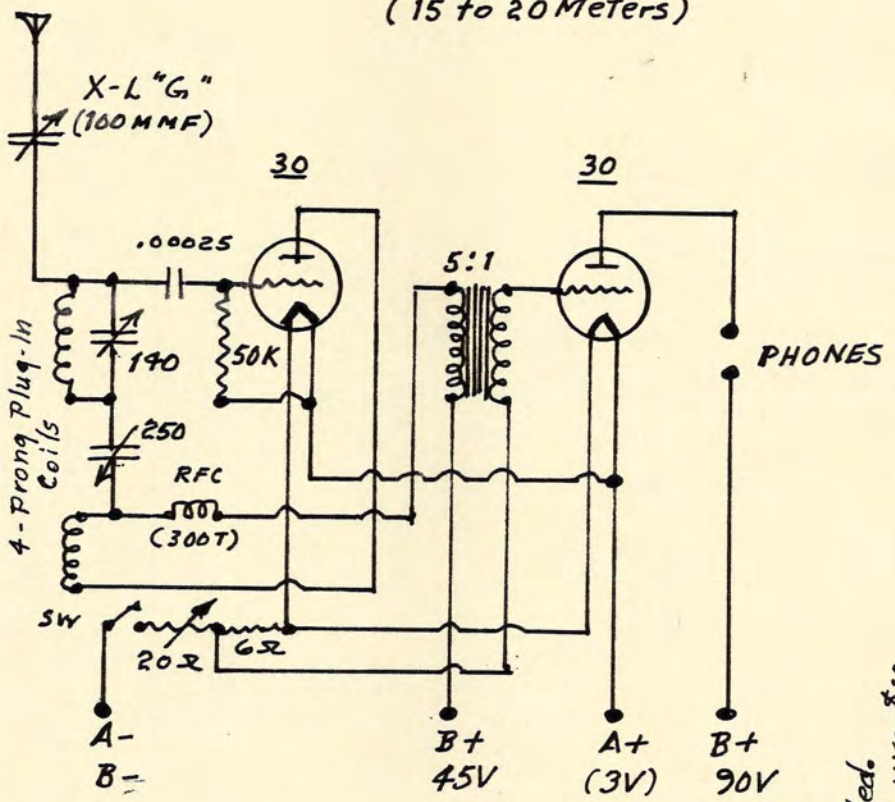


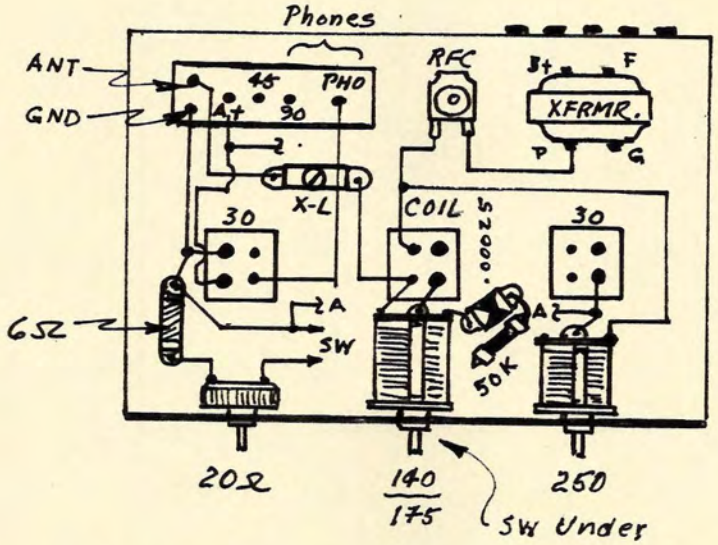
PANEL = 7"x12"x 1/8" Bakelite
SUB-PANEL = Wood
22 FIL VOLT. = 3.3V 40~12A FIL VOLT. = 4.5V/5V
REMLER #35 RFC

(RW 3-25-30)

TULLY SHORT-WAVE RECEIVER, 1932

(15 to 20 Meters)





NOTES:
Additional AF stage may be added.
Originally kitted by Radio Goods, NYC; $12.

(RW 2·27/4·2·32)

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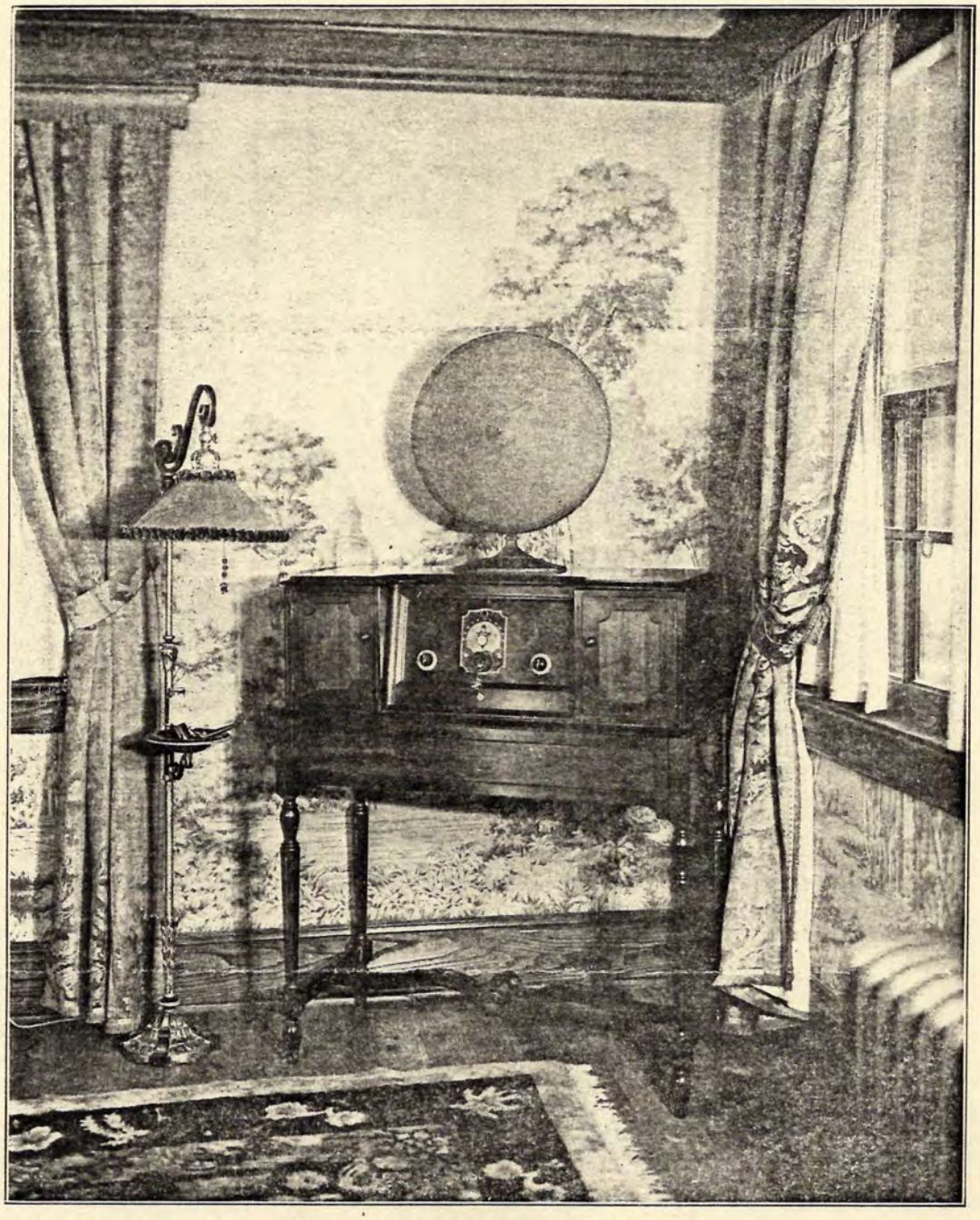

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GERNSBACK	*GREBE*	*HARKNESS*	*HAYNES*
HAZELTINE	*KELLOGG*	*KENNEDY*	*MAGNAVOX*
MARCONI	*NATIONAL*	*PARAGON*	*RAULAND*
REINARTZ	*R.E.LACAULT*	*SAMSON*	*SHAMROCK*
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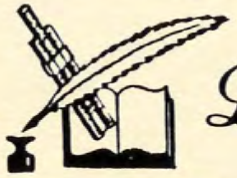

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